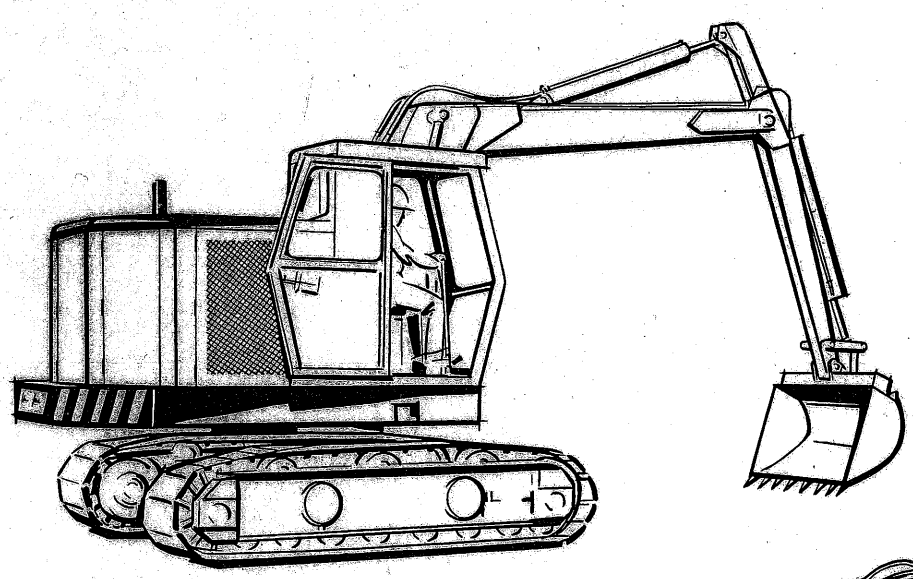
BULLETIN CED-26

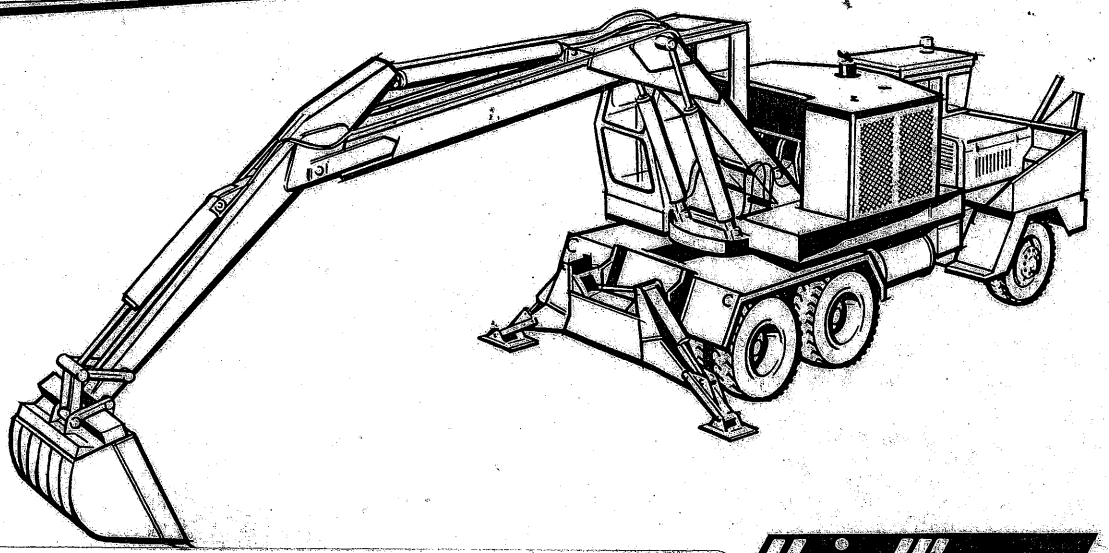
Hein-Werner

HYDRAULIC EXCAVATORS
Crawler and Carrier Mounted

model
serial no.

SERVICE and PARTS MANUAL





Price $4.00

9308128

PRINTED IN U.S.A.

Hein-Werner
CORPORATION
CONSTRUCTION EQUIPMENT DIVISION
WAUKESHA, WISCONSIN 53187

BULLETIN CED-26

Hein-Werner

service manual

HYDRAULIC EXCAVATORS

model

serial no.

This manual contains operating instructions, service information, and repair parts lists for all models unless otherwise noted.

Almost half a century of design and manufacturing experience has gone into your new Hein-Werner machine. It is the finest equipment that this know-how and modern technology can produce. We congratulate you on your selection.

We recommend that you become familiar with this manual and the maintenance procedures outlined herein. Following these instructions and operating the machine in a proper manner will assure you of long, dependable and profitable service.

Hein-Werner
CORPORATION
CONSTRUCTION EQUIPMENT DIVISION
WAUKESHA, WISCONSIN 53187

INSTRUCTIONS FOR ORDERING REPLACEMENT PARTS

To assure prompt and accurate service, include the following data with each parts order:

1. Model and Serial number of machine
2. Part numbers
3. Part descriptions
4. Quantity of each part desired
5. Correct shipping destination
6. Method of transportation
7. Engine Serial number

Confirm all telephone and telegraph orders in writing. Be sure these orders are marked "Confirmation," to avoid duplication of orders.

WHERE TO ORDER PARTS

Hein-Werner Dealers are conveniently located throughout the United States and Canada. These Dealers maintain a stock of genuine Hein-Werner replacement parts. Always order parts from your nearest Hein-Werner Dealer.

INSPECTION OF SHIPMENTS

Carefully inspect all shipments upon arrival. In the event of loss or damage, do not accept the shipment until the transportation company either makes a notation on the freight bill, or gives you an inspection report covering said damage or loss. In the event of concealed damage or loss, notify the carrier at once (within 20 days) requesting that an inspection be made and damage or loss be acknowledged.

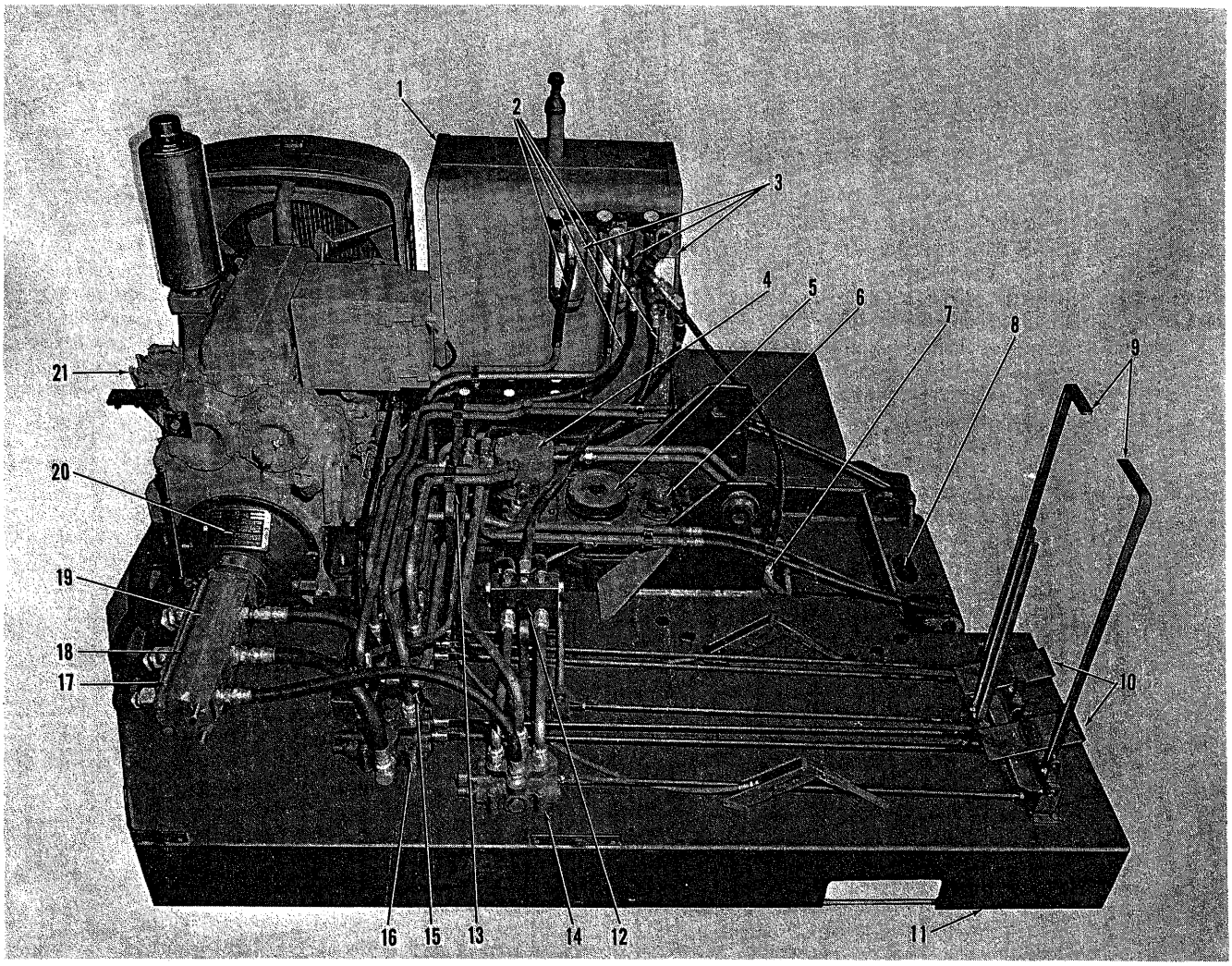
ADJUSTMENTS AND RETURNS

Refer to the written Warranty in this manual for an explanation of Warranty policy. If you feel a Warranty claim is in order, consult your Dealer. Claims must be made through your Dealer within a 15 day period from the time a failure occurs. Parts returned directly to the factory, without Dealer Authorization, will not be accepted.

USE ONLY GENUINE HEIN-WERNER PARTS FOR MAXIMUM PERFORMANCE

TABLE OF CONTENTS

		Page
SECTION I - DESCRIPTION		1
1-1.	Hydraulic Circuits and Controls	1
1-2.	Carrier	4
1-3.	Accessories	4
SECTION II - OPERATION		5
2-1.	Preparation for Use	5
2-2.	Initial Checks	5
2-3.	Starting the Engine	5
2-4.	Operating Controls	5
2-5.	Digging Hints	8
2-6.	Stopping the Engine	8
2-7.	Preparation for Storage	8
SECTION III - MAINTENANCE AND REPAIR		9
3-1.	Preventive Maintenance	9
3-2.	Lubricant Recommendations	9
3-3.	Maintenance Schedules	9
3-4.	Lubrication - Upperstructure	12
3-5.	Lubrication - Crawler	12
3-6.	Lubrication - Carrier	12
3-7.	Propel Drive Chain Adjustment	12
3-8.	Crawler Track Adjustment	12
3-9.	Hydraulic Circuit Pressure Checks	13
3-10.	Swing and Propel Brake Adjustment	14
3-11.	Tool Kits	15
3-12.	Gear Box Removal	15
3-13.	Propel and Swing Gear Box Repair	16
3-14.	Shaft Bearing Adjustment	18
3-15.	Gear Box Replacement	18
3-16.	Hydraulic Cylinder Repair	18
3-17.	Crawler Drive Sprocket Removal	20
3-18.	Tumbler or Idler Shaft Bushing, Thrust Washer and Seal Replacement	20
SECTION IV - REPAIR PARTS LIST		21



1. Hydraulic Reservoir
2. Return Lines
3. Filters
4. Hydraulic Swing Motor
5. House Brake Drum
6. Swing Gear Box
7. Hydra-Swivel
8. Ball Bearing Ring Gear
9. Levers
10. Foot Pedals
11. Machinery Platform
12. Pressure Compensating Unit
13. Inline Pressure Compensating Unit
14. Swing System Control Valve
15. Boom, Bucket, and Propel or Outrigger Control Valve
16. Dipstick and Propel or Outrigger Control Valve
17. Swing System, Pump System
18. Dipstick and Propel or Outrigger Pump Section
19. Boom, Bucket, and Propel or Outrigger Pump Section
20. Clutch
21. Engine

Figure 1. Machinery Platform

SECTION I

DESCRIPTION

1-1. HYDRAULIC CIRCUITS AND CONTROLS.

The information in this section is designed to furnish the owner and operator of Hein-Werner excavators with the basic information needed to understand the operation of the machine. An understanding of the various systems is essential to proper operation and service, and we suggest this description be read thoroughly.

Power for the unit is supplied by either a gasoline or diesel engine (21, Figure 1) the make of which is optional. (For service parts and information, refer to the engine manual supplied with your machine.) The engine is coupled to the hydraulic pump by either a direct drive shaft or a clutch (20). The clutch is extremely useful as a starting aid in cold weather. (If your machine is equipped with a clutch, refer to the separate section included with this manual.

The pump is a gear type, with three sections in tandem, mounted directly to the engine clutch housing. Each pump section is fitted with a separate supply line from the reservoir to assure proper oil flow. The pump section (19) closest to the engine delivers power to the boom, bucket, and propel control valve (15) on the crawler mounted machine, and to the boom, bucket, and outrigger system on the carrier mounted machine. The center pump section (18) supplies power to the dipstick and propel circuit valve (16) on the crawler mounted machine and to the dipstick and outrigger system on the carrier mounted machine. The pump section (17) furthest from the engine delivers power to operate the swing circuit on all models. The three pump sections are completely independent of each other enabling simultaneous use of all three circuits.

The oil flows from the pump to the three control valves. When the control valves are in a neutral position, the oil flows without restriction through the control valve and return lines (2) to the filters (3) which are mounted on the hydraulic reservoir (1). Each circuit is equipped with a filter which contains a cleanable filtering element. Disposable elements also are available as a replacement part. After being filtered, the oil flows directly into the reservoir.

The control valves are operated by levers (9) and foot pedals (10) in the operator's cab. The cab is also equipped with a complete set of engine gages and controls. The engine gage set consists of an ammeter, individual gages for fuel level, oil pressure and water temperature, and a combination tachometer and engine revolution hour meter. When a typical cylinder circuit is put into operation by moving the control lever or foot pedal in either direction from the neutral position, the valve spool moves within the control valve. This spool reroutes the oil flow from the return line port to the port which supplies oil to the cylinder being used. This spool is spring-loaded to return to neutral position when the control lever or pedal is released. The control valves have excellent "feathering" characteristics to assure smooth and precise operation of all components. The control valves contain a relief valve which is adjusted at the factory to a specified limit. If the pressure demanded by the circuit being used exceeds this pre-set limit, the relief valve will bypass the oil to the reservoir until the pressure demanded by the circuit drops to the specified pressure setting. The digging members are also protected from overload by an inline pressure compensating unit (13). This unit relieves the pressure in the boom and dipstick circuits when external forces cause the pressure to exceed the maximum allowable. The swing circuit is controlled by the single spool control valve (14). This valve and its built-in relief valve are identical in design and purpose to the typical cylinder control valve already described. The swing circuit is also further protected by a pressure compensating unit (12) which minimizes shock loads. The double rotation, positive displacement hydraulic motor (4) provides unlimited swing in either direction.

The motor is directly coupled to the swing gear box (6) which is mounted to the machinery platform (11) with specially ground alloy steel studs. This mounting assures perfect mesh between the output pinion and the ball bearing ring gear at all times. All gears and shafts in the swing system are precision machined and hardened to give maximum life. The shafts are carried by tapered roller bearings. The cover and case are precision bored and milled to assure precise gear mesh.

The use of a double row ball bearing ring gear (8) results in reduced maintenance, smoother rotation, and longer life. The bearing requires no day-to-day maintenance other than lubrication.

The crawler propel control valve is essentially the same as the other control valves except for an added "detent" feature. This "detent" mechanism holds the valve spool in either position to allow the operator to perform other operations while traveling. The control levers must be manually returned to the neutral position to stop the crawler travel. When the propel circuit is in operation, the oil flows from the control valve, through the hydra-swivel (7) to the propel motors. The hydra-swivel is used on both the carrier and the crawler mounted machines. Its purpose is to allow oil to flow from the upper structure to the propel motor or the outrigger cylinders which are located on the non-rotating portion on the machine. This is accomplished

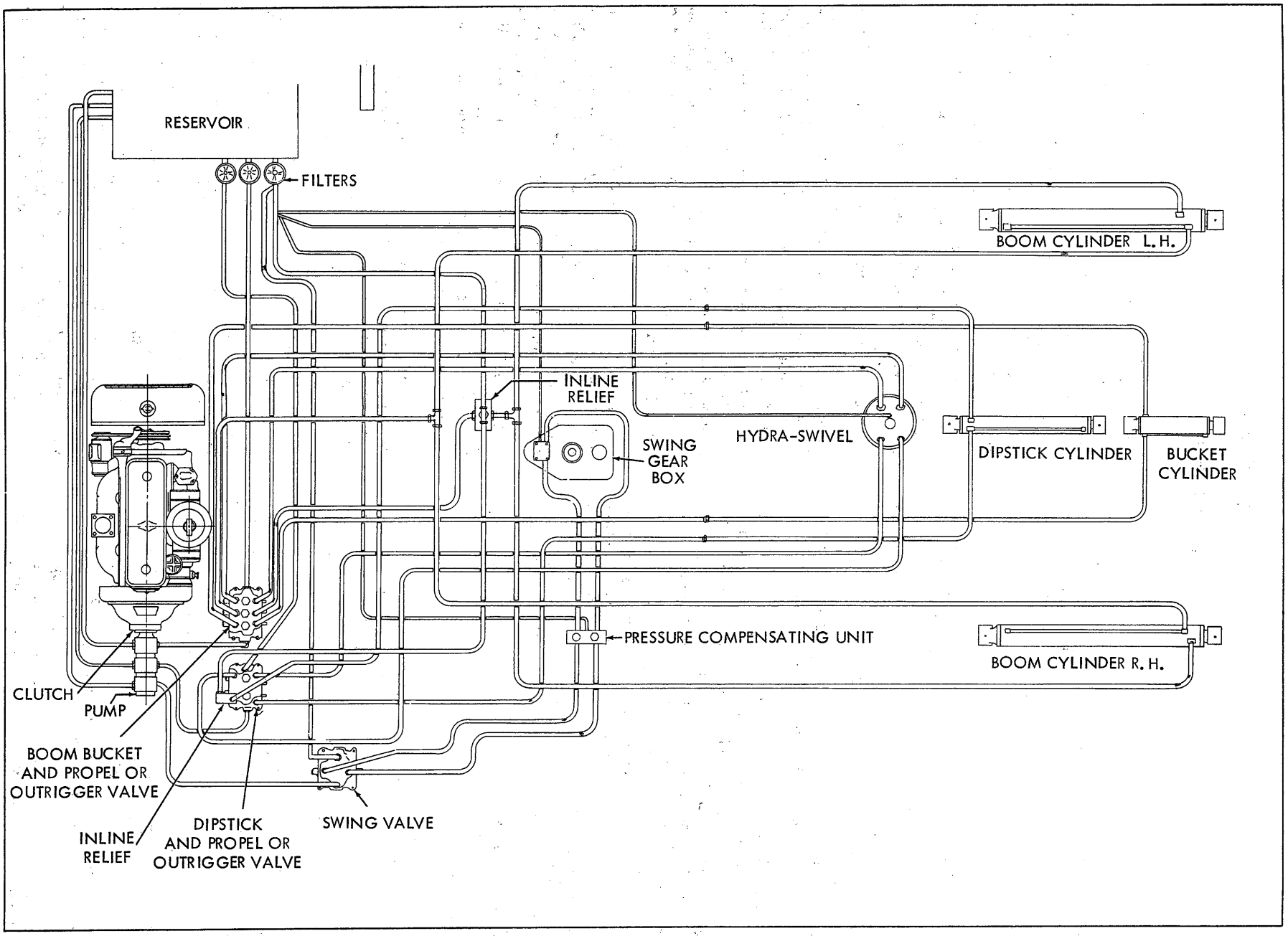


Figure 2. Upper Circuitry

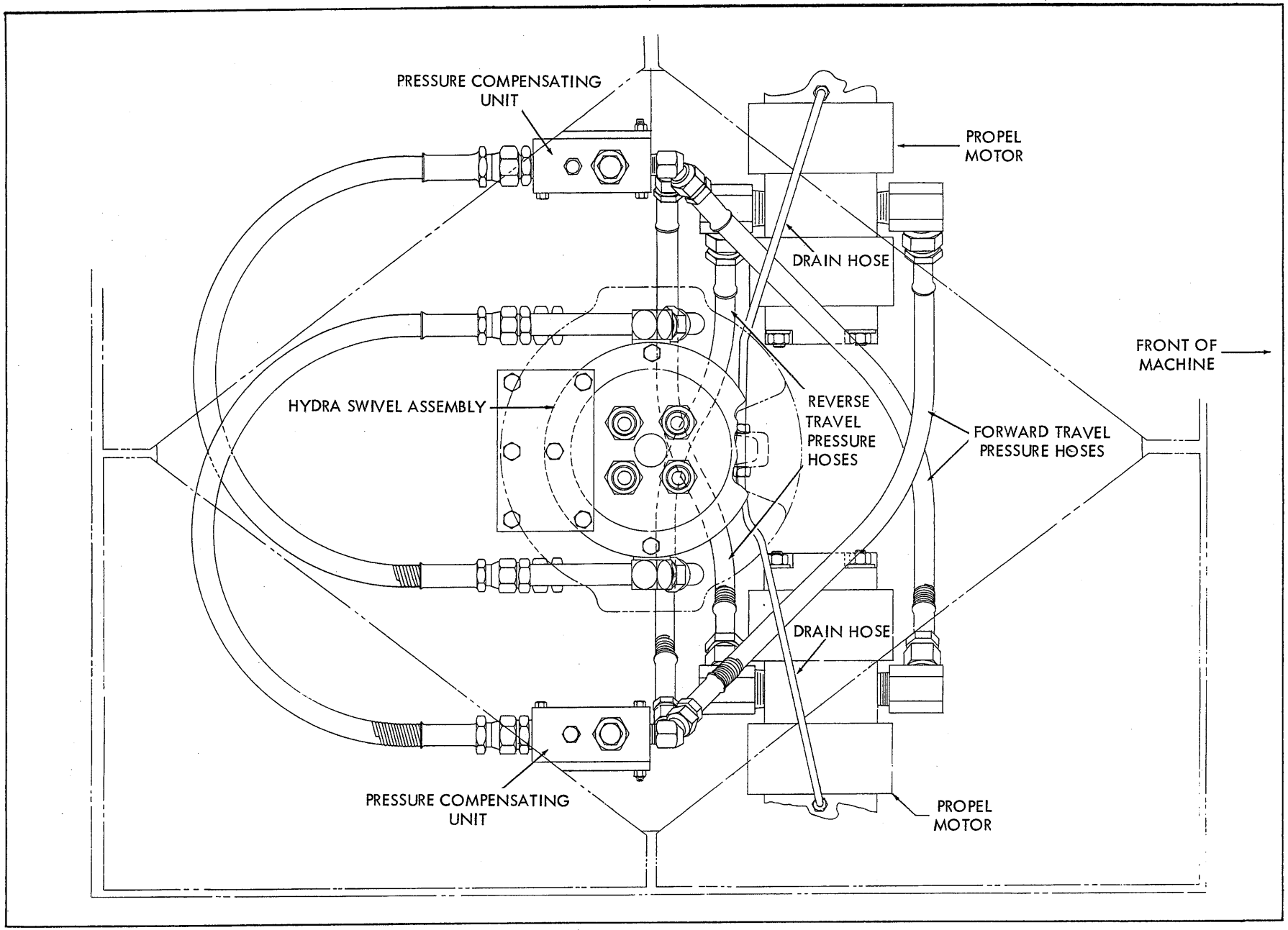


Figure 3. Lower Circuitry, Crawler

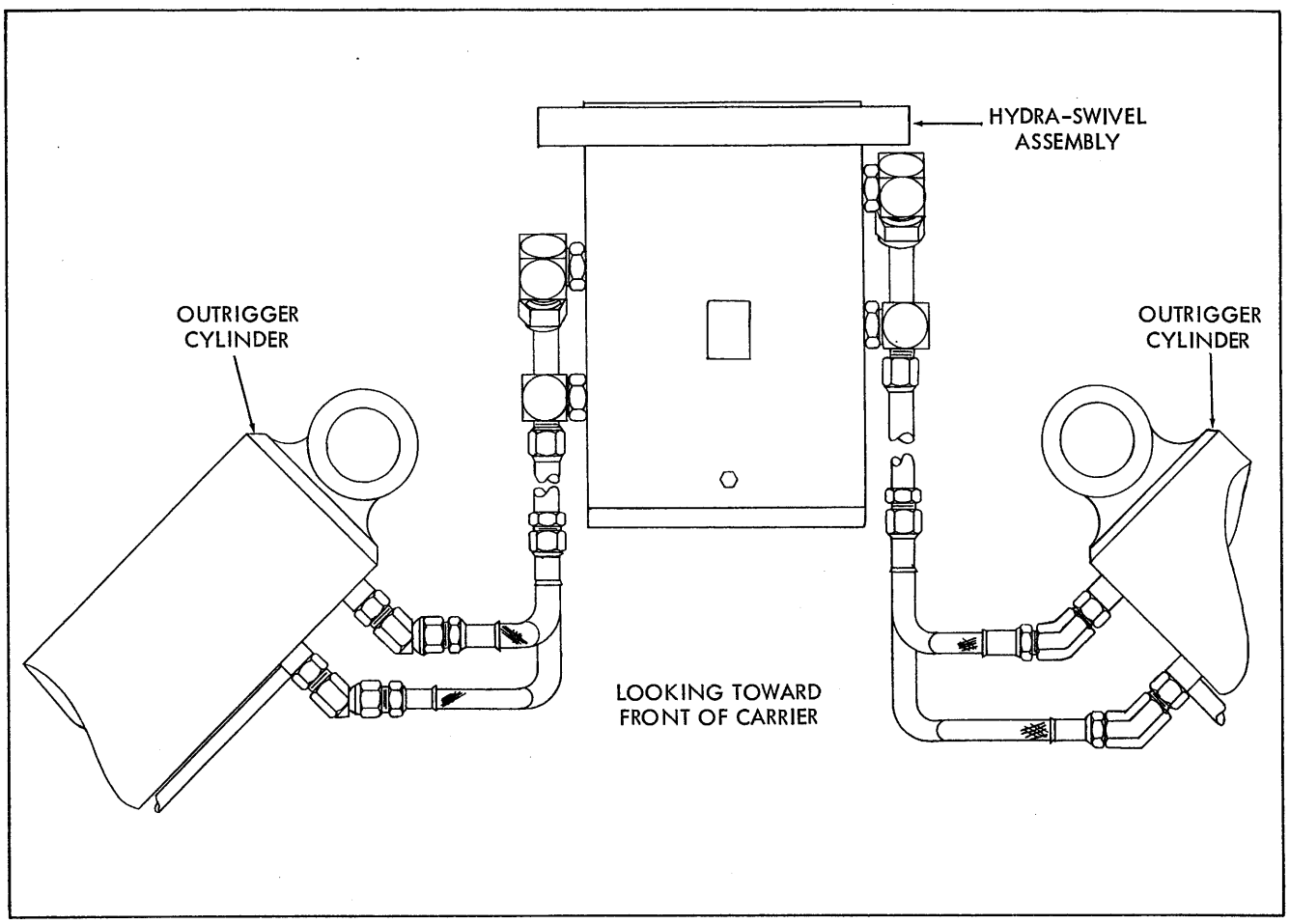


Figure 4. Lower Circuitry, Carrier

by the use of a series of ported grooves which are sealed with "O" rings.

The two propel motors are mounted directly to the propel gear boxes. Each track of the crawler is driven by a separate motor and gear box. This independent drive results in greatly increased maneuverability.

The crawler track assemblies and carbody are designed for long trouble-free service. The carbody and side frames are rugged, steel fabrications which are reinforced at all points of stress concentration. The components of the track assemblies such as the track shoes, tumblers, idlers, rollers, and sprockets, are made from high grade heat treated alloy steel with excellent durability characteristics. These parts are designed to provide good dirt shedding qualities. The 20 track rollers are equipped with pre-greased ball bearings with armor shields to protect the seal from dirt, branches, and other foreign matter. The use of these bearings also results in reduced day-to-day maintenances of the track assembly.

1-2. CARRIER

The standard Hein-Werner Carrier is of rugged job-proven design. The carrier can be equipped with a remote control unit which enables the operator to steer, shift, brake, and accelerate the carrier from within the excavator cab.

1-3. ACCESSORIES

Accessories include a log grapple, a clam shell bucket, frost point, and a special 60" ditch cleaning bucket. Various standard buckets are also available. These buckets range in size from 16" to 48" widths.

If your machine is equipped with any of the above mentioned accessories, refer to the special section in this manual for service and parts information.

The following basic schematics will be useful in tracing the hydraulic circuitry:

1. Upper circuitry (Figure 2).
2. Lower circuitry, crawler (Figure 3).
3. Lower circuitry, carrier (Figure 4).

SECTION II

OPERATION

2-1. PREPARATION FOR USE.

Before operating the machine, make the following checks and adjustments:

ALL MODELS

1. Engine checks (see engine manual for detailed instructions).

   a. Crankcase oil level.

   b. Fan belt tension.

   c. Coolant level.

   d. Air cleaner.

   e. Level of electrolyte in battery.

   f. Battery and terminals for corrosion.

   g. Tightness of mounting bolts.

   h. Fuel level.

2. Upperstructure checks.

   a. Security of fuel, oil, and electrical connections.

   b. Freedom of operation of all controls.

   c. Oil level in hydraulic reservoir. Remove the high level plug and check that the oil level is between the high level plug and the low level plug. If necessary, add premium grade SAE 20 oil.

   d. Damage which may have occurred in shipment.

   e. Level of lubricant in gear boxes. If necessary, add EP 80-90 oil.

   f. Lubricate entire machine as required; see paragraphs 3-4, 3-5, and 3-6.

CRAWLER MODELS

1. Carbody and side frame assembly checks.

   a. Tightness of all mounting bolts, see Table 4.

   b. Track adjustment, see paragraph 3-8.

   c. Drive chain adjustment, see paragraph 3-7.

2. When the crawler-mounted machines are shipped from the factory, they are assembled to the legal 96-inch shipping width. They may be operated at this width or extended to 104 inch width for greater stability. To extend the tracks, proceed as follows:

   a. Swing the boom (see Figure 5) over the side of the tracks and with the bucket tucked, apply down pressure with the boom to lift the track off the ground.

   b. Block up the machine and release pressure on the boom.

   c. Remove the four locking bolts. Attach a chain to the side frame and the bucket. Use the bucket to pull the tracks out until the side frame is flush with the cross tube.

   d. Replace and tighten the locking bolts in the second set of holes. Extend the opposite track in a similar manner. Each track will move out four inches to give 104 inch overall width.

2-2. INITIAL CHECKS.

SWING BEARING

After six to eight hours of running time, check the swing bearing mounting bolts for tightness. Torque the bolts to 2400 inch pounds.

CYLINDERS

After four to eight hours of initial operation, tighten the hydraulic cylinder packing nuts to prevent excessive escape of hydraulic oil around the cylinder rods. Tighten the nuts until they are snug and then back them off 1/4 to 1/2 turn. Do not overtighten; a small seepage of oil at these points is necessary for cylinder rod lubrication.

2-3. STARTING THE ENGINE.

Leave all control levers in neutral. Place throttle in approximately half-fuel position. Place ON-OFF switch in ON position or place fuel shut-off lever in RUN position. Depress starter button to crank engine. If engine fails to start after two or three attempts, refer to engine manual for cause of trouble and instructions to correct it.

2-4. OPERATING CONTROLS (See Figure 6).

Operators not familiar with hydraulic machines may tend to over-control and thereby cause rough operation of the machine. It is recommended that the machine be operated at half throttle or less until the operator gets the "feel" of the controls. The throttle setting may then be gradually increased to fully governed speed. The operation of each control is as follows:

BOOM CONTROL LEVER

1. To raise boom, pull boom control lever back.

2. To hold boom in position, move control lever to center position (neutral).

3. To lower boom, push boom control lever forward.

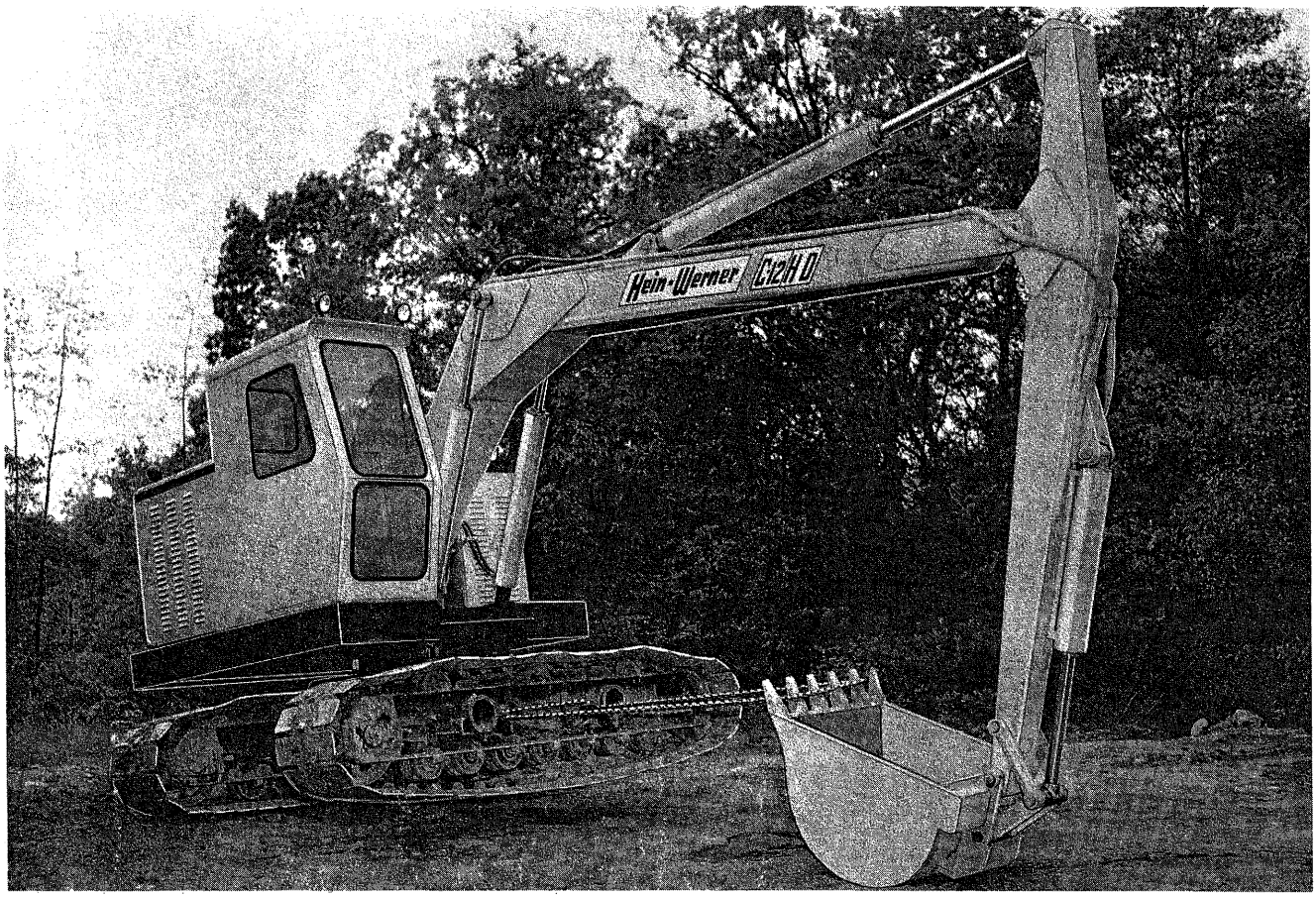


Figure 5. Extending Crawler Tracks

BUCKET CONTROL PEDAL OR LEVER

1. For normal operation, use the foot pedal to control the bucket. However, for very close work when speed is not a factor, use the lever to control critical movement of bucket.

2. To place bucket in closed position, push down with heel of left foot on the pedal or pull the lever back.

3. To hold bucket in position, move the pedal or lever to center position (neutral).

4. To place bucket in open position, push down with toe of left foot on the pedal or push the lever forward.

DIPSTICK PEDAL OR LEVER

1. For normal operation, use the foot pedal to control the dipstick. However, for very close work when speed is not a factor, use the lever to control critical movement of dipstick.

2. To tuck dipstick in, push down with heel of right foot on the pedal or pull the lever back.

3. To hold dipstick in place, move the pedal or lever to center position (neutral).

4. To open dipstick, push down with toe of the right foot on the pedal or push the control lever forward.

SWING CONTROL LEVER

1. To swing platform in a clockwise direction, push lever forward.

2. To swing platform counterclockwise, pull lever back.

The swing of the platform is controlled by reversing the control lever. Slight overcontrol allows the machine to be operated with a high degree of smoothness with no abrupt or dead stops. For example, if the machine is rotating clockwise (lever pushed forward), feather the lever back toward the operator until the rotation stops. If one particular position is desired, lock the platform in place with the swing brake control lever.

SWING BRAKE OR PROPEL BRAKE LEVER

1. To engage brake, pull up on the lever. The lever will snap into an overcenter lock position.

2. To release brake, push the lever down.

PROPEL OR OUTRIGGER CONTROL LEVERS

PROPEL LEVERS

When in the normal traveling position (drive sprockets to the rear), follow the instructions below. When in reversed position (drive sprockets to the front), reverse all directional instructions. The speed of travel is governed by the engine speed.

1. To propel machine forward, push both levers forward.

2. To propel machine backward, pull both levers back.

3. To make a right hand turn, use any of the following procedures:

   a. Push the left lever forward and leave the right lever in neutral.

   b. Pull the right lever back and leave the left lever in neutral.

   c. When working in close quarters, or when speed is required, a right hand "spin" turn may be made by simultaneously pushing the left hand lever forward, and the right hand lever back.

4. To make a left hand turn, reverse the above directions.

OUTRIGGER LEVERS

1. To set outriggers, push both levers forward.

2. To raise outriggers, pull both levers back.

When in the digging position (boom extended over the rear of the carrier), the left outrigger is controlled by the left lever.

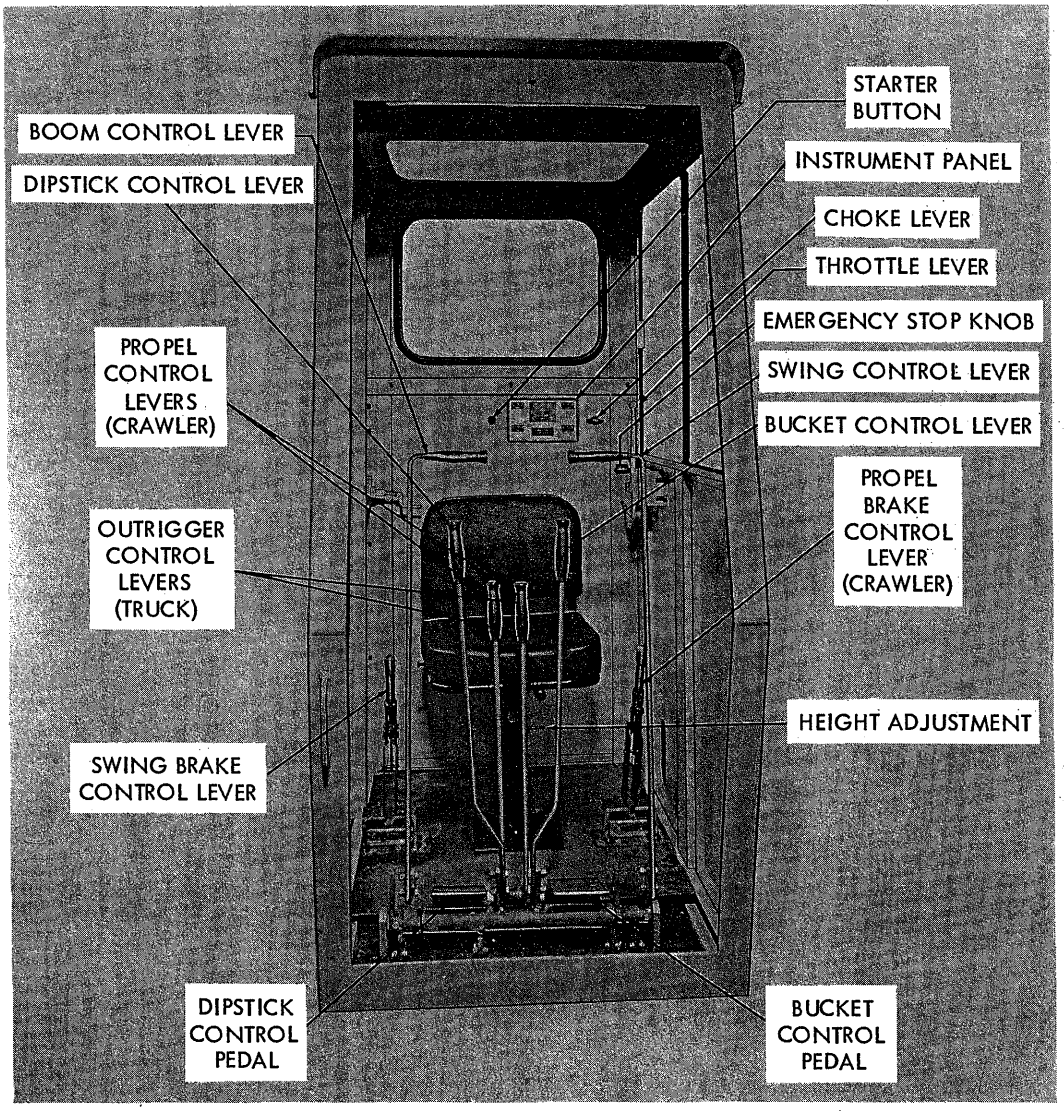


Figure 6. Operating Controls

SEAT ADJUSTMENT CONTROLS

The seat height can be adjusted by pulling out the height adjustment pin, setting the seat to the desired height and then reinserting the pin.

The seat can be moved forward and backward by pulling out the pin under the seat, sliding the seat cushion to the desired position and then reinserting the pin.

2-5. DIGGING HINTS.

1. Keep the machine as close to the work as possible. This results in a greater mechanical advantage and also cuts down the cycle time. Start a cut with the dipstick at right angles to the boom point; this will decrease cycle time because the boom does not have to be repositioned as often.

2. Tuck in the dipstick as the boom is raised out of a cut; this will permit clearing the top of the cut sooner and reduce the cycle time. Square cuts for manholes, etc., can be made easier by moving the machine in line with each bank, rather than using the swing to get from bank to bank.

3. Make straight down end cuts by extending the dipstick and bucket and moving the machine forward or back to reach the bottom of the cut. To decrease cycle time, especially in a deep cut, shave off a layer at a time, rather than going to the bottom of the cut on every cycle. Rocks and stumps can be uncovered, undermined, and pried out using the bucket.

4. For faster dumping, open both the bucket and the dipstick. When digging in gravel, stones, or shale, use the bucket teeth to loosen the material so that the bucket can be filled on the next cycle. When digging in clay or hard soil, use the bucket in a flat position and shave or peel the soil by moving the boom and dipstick. The bucket can be removed and reattached in an inverted position to use the machine for shovel operation.

2-6. STOPPING THE ENGINE.

1. Reduce engine speed to idle. Allow engine to operate at idle speed for approximately five minutes to normalize engine temperature, then place the ON-OFF switch or fuel shut off lever in OFF position. Do not stop the engine suddenly unless it is absolutely necessary.

2. If the engine continues to run after the fuel shut-off lever is placed in OFF position, pull emergency stop knob located on back wall of cab. This will shut off the air supply to the engine by tripping the air shut-off valve. If air shut-off valve has been tripped, it must be reset before the engine will operate. To reset the air shut-off valve, first push the emergency stop knob all the way in, and then manually reset the air shut-off valve latch. Refer to the engine manual for detailed instructions.

2-7. PREPARATION FOR STORAGE.

If the machine is to be stored for an indefinite length of time, perform the following procedures, subject to the length of the anticipated storage period:

1. Drain fuel system and refill with Valvoline Oil Company "Tectyl 503-C" rust preventative compound or its equivalent.

2. Drain engine lubricant and refill with engine preservative oil.

3. Drain engine cooling system and refill with corrosion inhibitor.

4. Crank engine to circulate preservative oils through fuel and lubricating systems.

5. Drain lubricant from swing and propel gear boxes and refill with preservative oil.

CAUTION

Wherever fluid systems have been drained, attach a waterproof tag to the tank or engine, to warn the operator not to operate the machine until the system(s) have been drained and refilled with correct fluid.

6. Remove battery.

7. Relieve engine belt tension. Tag the belts to indicate that belt tension must be adjusted before starting engine.

8. Wipe machine to remove all film and dirt. Apply preservative to any exposed metal surfaces subject to corrosion through prolonged non-usage, such as valve spools, cylinder rods, etc.

9. Close and secure all doors. Seal all openings with waterproof paper.

10. Fill hydraulic system completely with hydraulic oil.

SECTION III

MAINTENANCE AND REPAIR

3-1. PREVENTIVE MAINTENANCE.

It is impossible to overstress the importance of preventive maintenance. A well organized, day-to-day preventive maintenance schedule will save you expensive "downtime" and costly repairs. In addition it will help to insure proper operation and extended life of the machine.

This section outlines suggested maintenance schedules, lubrication guides, and minor adjustments which should be made to maintain optimum performance from your machine. These schedules, and the preventive maintenance record sheets included with this manual, will help you organize a good system of daily care which best suits your particular operation.

The maintenance requirements listed are for average working conditions. If your machine is subject to adverse conditions, such as extreme dust, moisture, etc., the frequency and extent of the maintenance precedures should be increased accordingly.

A one year supply of "Preventive Maintenance Record" forms is included at the end of this manual. A sample copy, with several typical entries made, has also been included to show how these records may be maintained. These records, when kept complete and up-to-date, will benefit both the owner and the operator.

3-2. LUBRICANT RECOMMENDATIONS.

To insure maximum efficiency and long life, use the lubricants recommended in Table 1 or their equivalent.

3-3. MAINTENANCE SCHEDULES.

Follow the maintenance schedules and procedures as outlined in Tables 2 and 3.

Table 1. Recommended Lubricants

Part	Lubricant
Gear Boxes	EP 80-90 oil
Open Gears	Crater compound
Swing bearing (4 fittings)	Mobilux GR #2 or equivalent.
Gear box bearing grease fittings	Mobil No. 5 grease, or equivalent.
All other grease fittings	Moly type grease, such as Mobiloil special or equivalent.
Hydraulic reservoir	Premium grade SAE 20 oil.

Table 2. Preventive Maintenance and Inspection Schedule
(Upperstructure - All Models)

Frequency	Service or Inspection to be Performed
Daily	Lubricate as required. See paragraph 3-4.
Daily	Inspect for and correct any fuel, oil, coolant, or hydraulic system leaks.
Daily	Check oil level in swing gear box. If necessary, add oil as specified in Table 1.
Daily	Check oil in hydraulic reservoir. If necessary, add oil as specified in Table 1.
Daily	Check back pressure indication of filter gages. If gage registers in "red zone," clean or replace filter element.
Daily	Check engine for: crankcase oil level, coolant level, engine belt tension; and level of electrolyte in battery(s). (See engine manual for complete specifications.)
Weekly	Check swing bearing mounting bolt torque; tighten to 2400 inch pounds if necessary.

Table 2. Preventive Maintenance and Inspection Schedule (Cont)
(Upperstructure - All Models)

Frequency	Service or Inspection to be Performed
Monthly	Check hydraulic system pressures. See paragraph 3-9 for detailed instructions.
Monthly	Check swing brake adjustment. See paragraph 3-10.
Monthly	Check all mechanical linkage connections.
Monthly	Check all mounting and assembly bolts. Tighten if necessary. Refer to Table 4.
Monthly	Check all hydraulic system hoses, lines, and fittings for signs of possible trouble.
As required	Inspect bucket teeth and replace as necessary. Do not use shanks without teeth for digging.
As required	Remove filter screen from hydraulic reservoir. Clean screen thoroughly with cleaning solvent. Be sure filter screen is in place when adding oil.

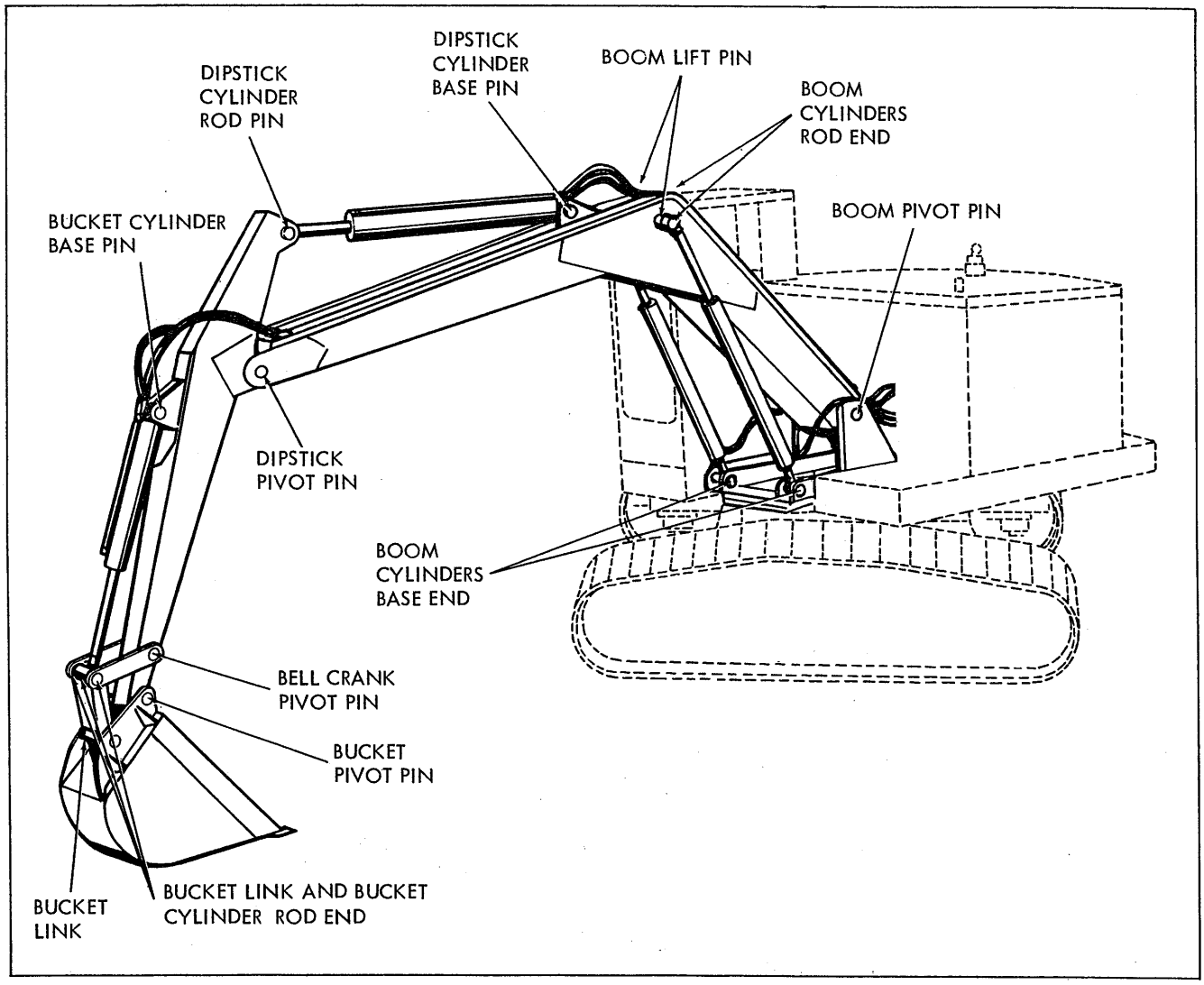


Figure 7. Lubrication Diagram — Sheet 1

Table 3. Preventive Maintenance and Inspection Schedule - Crawler

Frequency	Service or Inspection to be Performed
Daily	Check level of lubricant in propel box. See paragraph 3-15.
Daily	Lubricate as required. See paragraph 3-5.
Weekly	Check propel drive chain adjustment. See paragraph 3-7.
Weekly	Check crawler track adjustment. See paragraph 3-8.
Monthly	Check propel brake adjustment. See paragraph 3-10.
Monthly	Check all mounting and assembly bolts. Tighten if necessary. Refer to Table 4.
Monthly	Check all mechanical linkage connections.
Monthly	Check all hydraulic system hoses, lines, and fittings for signs of possible trouble.

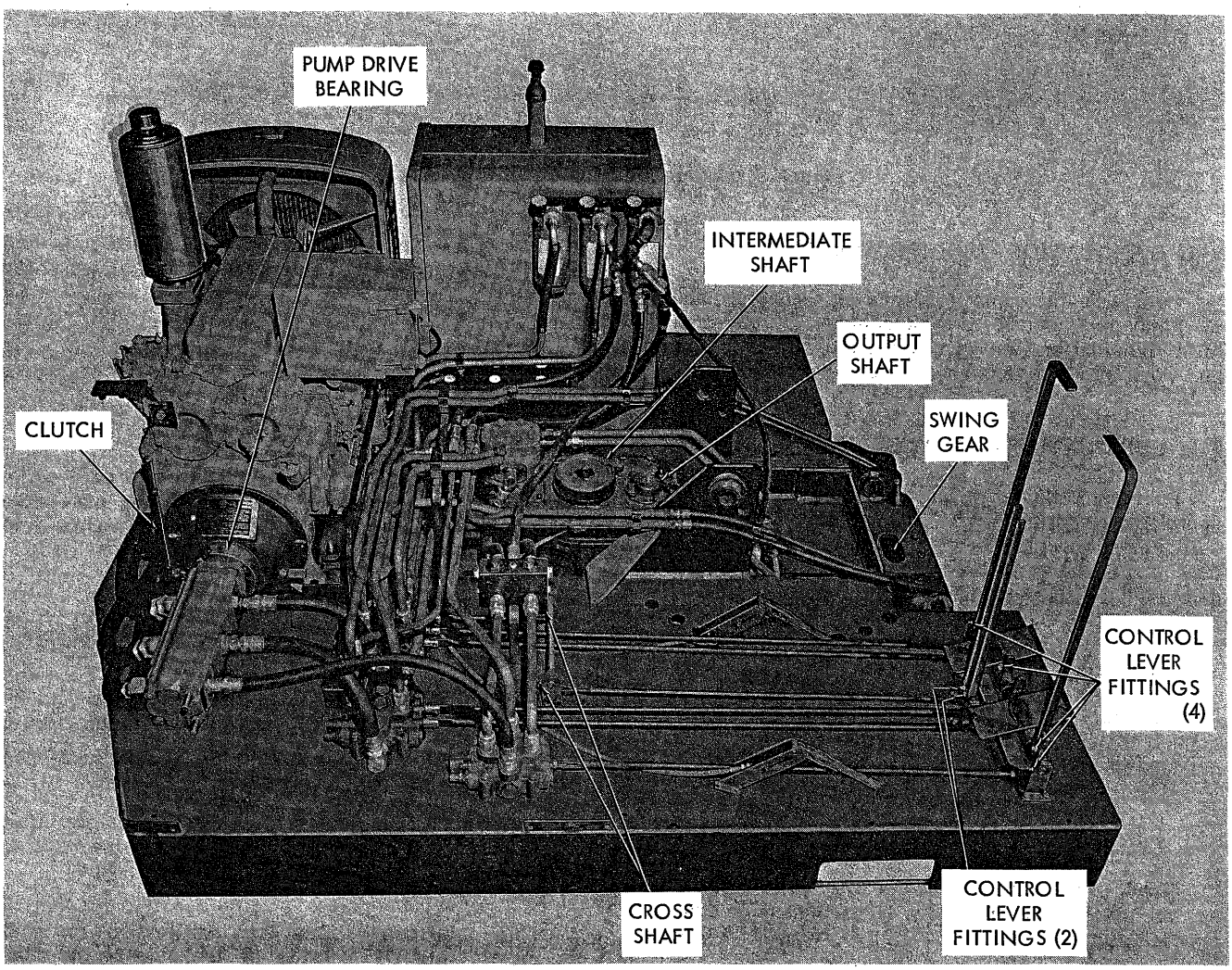


Figure 8. Lubrication Diagram — Upperstructure, Sheet 2

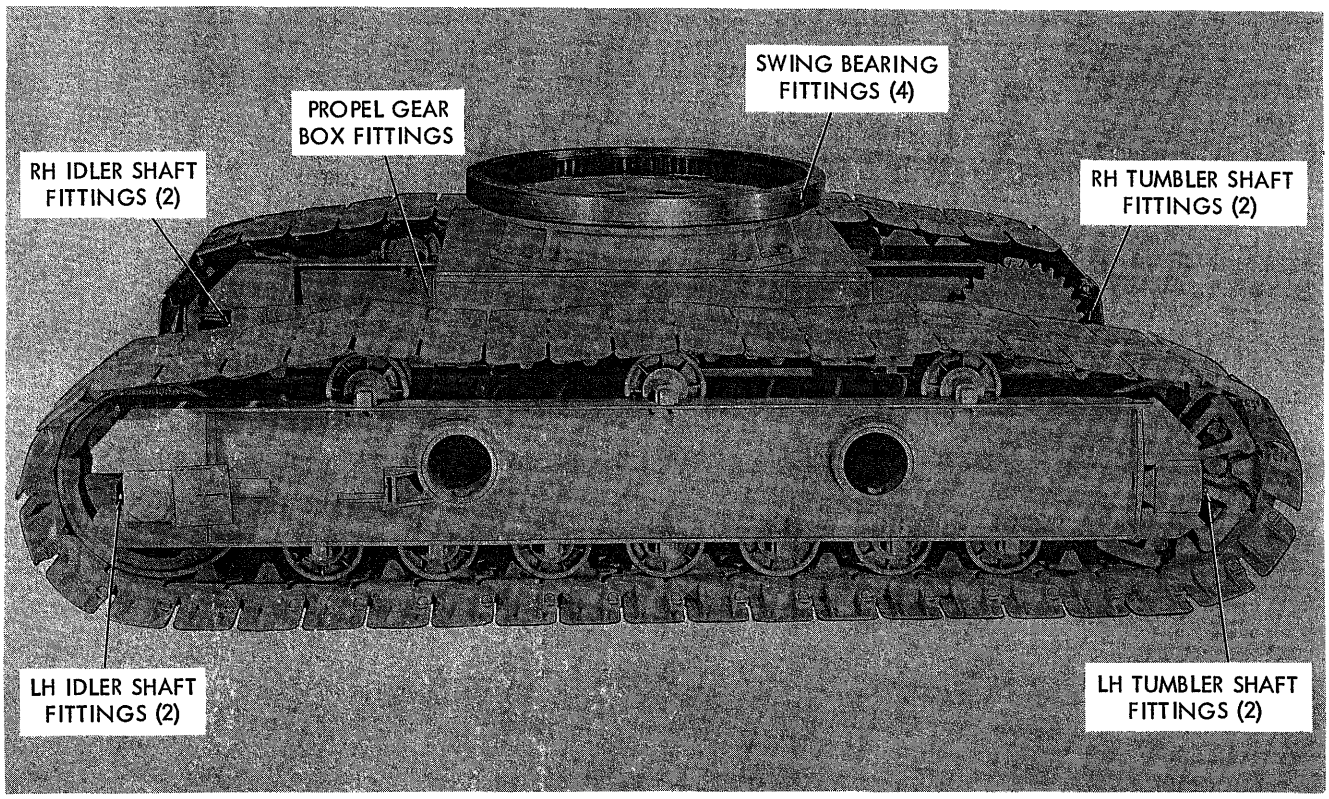

SWING BEARING FITTINGS (4)
PROPEL GEAR BOX FITTINGS
RH IDLER SHAFT FITTINGS (2)
RH TUMBLER SHAFT FITTINGS (2)
LH IDLER SHAFT FITTINGS (2)
LH TUMBLER SHAFT FITTINGS (2)

Figure 9. Lubrication Diagram — Crawler

3-4. LUBRICATION - UPPERSTRUCTURE.

Lubricate the upperstructure at the points shown in Figures 7 and 8. Always remove excess grease after lubrication, or dirt and dust will accumulate and work into bearings and bushings.

3-5. LUBRICATION - CRAWLER.

Lubricate the crawler assembly at the points specified in Figure 9. Be sure to lubricate crawler daily, even though the machine has not been traveling, since there is movement when swinging and digging. DO NOT lubricate propel drive chain.

3-6. LUBRICATION - CARRIER AND OUTRIGGERS.

Lubricate carrier as specified in the carrier manual shipped with your machine. Lubricate the outriggers at the points indicated in Figure 10.

3-7. PROPEL DRIVE CHAIN ADJUSTMENT.

Check propel drive chain for 3/4" to 1" deflection on the slack side of chain. If necessary to adjust, proceed as follows:

1. Loosen the four propel box mounting bolts (Figure 11) which attach gear box to side frame.

2. Loosen the four adjusting bolt lock nuts and tighten both adjusting bolts equally to adjust chain until deflection is 3/4" to 1".

3. Tighten lock nuts and gear box mounting bolts and recheck deflection.

3-8. CRAWLER TRACK ADJUSTMENT.

The crawler tracks should be adjusted until some slack exists. When there is no slack, or excessive slack, adjust the tracks at the idler end of the side frame (Figure 12) as follows:

1. Remove shim cover plate.

2. Insert Hein-Werner Pushmaster unit, supplied with tool kit, as shown.

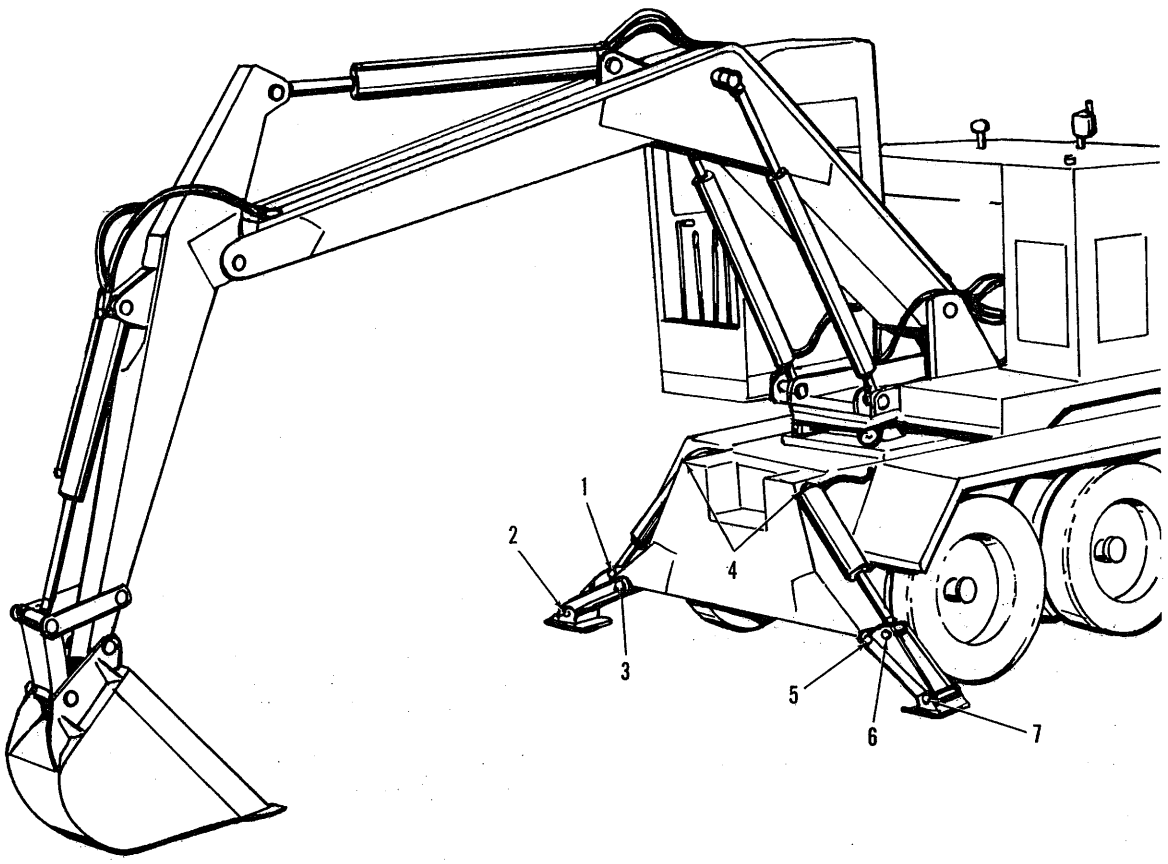
3. Turn the relief knob clockwise, and "jack" out the idler bearing block until correct slack exists.

4. Install the 1/4" and 1/8" thick shims (furnished in the tool kit) as required to take up play.

5. Release the pressure on the Pushmaster Unit by turning relief valve knob counterclockwise.

6. Replace the shim cover plate.

This adjustment must be performed on both the inside and the outside of the side frame. The two idler bearing blocks must be adjusted equally to keep the idler from becoming "cocked."



1. Outrigger Cylinder Rod Pin
2. Outrigger Foot Pivot Pin
3. Outrigger Arm Pivot Pin
4. Outrigger Cylinder Base Pin
5. Outrigger Arm Pivot Pin
6. Outrigger Cylinder Rod Pin
7. Outrigger Foot Pivot Pin

Figure 10. Lubrication Diagram — Outriggers

3-9. HYDRAULIC CIRCUIT PRESSURE CHECK.

The correct control valve and pressure compensating unit adjustments have been made before shipping from the factory. Only factory and dealer representatives are authorized to adjust valve pressure settings. TAMPERING WITH PRESSURE SETTINGS WILL RESULT IN VOIDING THE WARRANTY OF THE MACHINE. However, at the intervals specified in the maintenance schedule, or in the event of malfunction, check the pressure settings as follows:

NOTE

Be sure gage is indicating correctly before proceeding.

1. BOOM CIRCUIT PRESSURE CHECK. Install 0-3000 psi pressure gage in boom cylinder testing port as shown in Figure 13. Run engine at full throttle and pressurize boom cylinder rod end by pushing boom control lever forward. Boom cylinder pressure gage should indicate 1850 to 1900 psi.

2. BUCKET CIRCUIT PRESSURE CHECK. Install 0-3000 psi pressure gage in bucket cylinder testing port as shown in Figure 14. Run engine at full throttle and pressurize bucket cylinder rod end by pushing bucket control lever forward. Bucket cylinder pressure gage should indicate 2050 to 2100 psi.

3. DIPSTICK CIRCUIT PRESSURE CHECK. Install 0-3000 psi pressure gage in dipstick cylinder testing port as shown in Figure 15 at base end of the cylinder. Run engine at full throttle and pressurize dipstick cylinder rod by pulling dipstick control lever back. Dipstick cylinder pressure gage should indicate 2050-2100 psi.

4. PROPEL CIRCUIT PRESSURE CHECK. Place machine so that forward and backward travel are

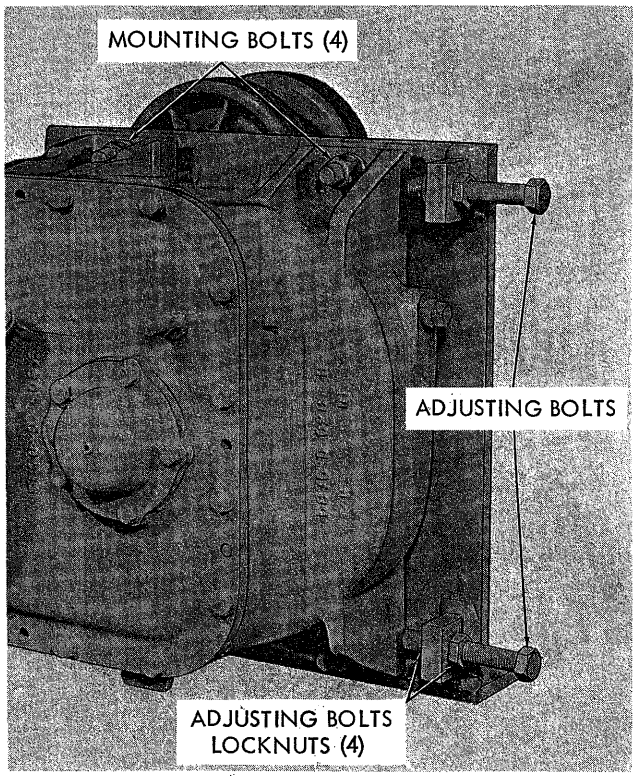


Figure 11. Propel Drive Chain Adjustment

completely blocked. Install 0-3000 psi pressure gage in each propel crossover valve as shown in Figure 16. With engine at full throttle, push both propel control levers forward. The gages should indicate 2050-2100 psi. If the gages do indicate no pressure reading, repeat same procedure except pull both levers back. The two gages should read 2050 to 2100 psi.

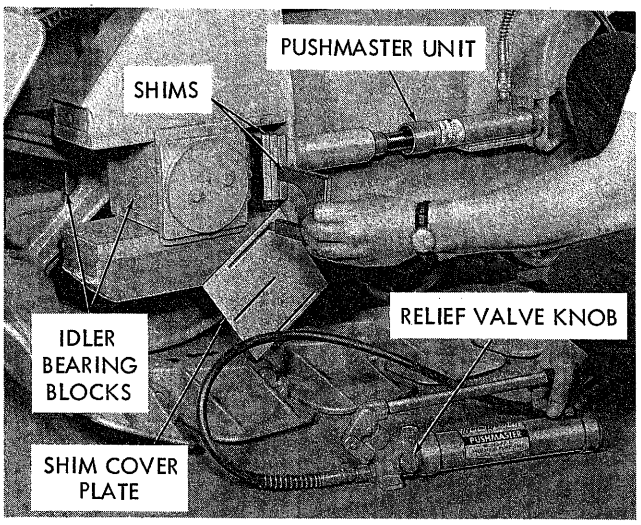


Figure 12. Crawler Track Adjustment

5. SWING CIRCUIT PRESSURE CHECK. Place unit so that swing is completely blocked in both directions. Install 0-3000 psi pressure gages in pressure compensating unit counterclockwise and clockwise swing testing ports as shown in Figure 17. Run engine at full throttle and pressurize swing circuit for clockwise swing by pushing swing control lever forward. Pressure gage in clockwise swing testing port should indicate 1650 to 1700 psi. Run engine at full throttle and pressurize swing circuit for counterclockwise swing by pulling swing control lever back. Pressure gage in counterclockwise swing testing port should indicate 1650 to 1700 psi.

3-10. SWING AND PROPEL BRAKE ADJUSTMENT.

The swing brake is common to all models. Crawler mounted machines, in addition, are equipped with a

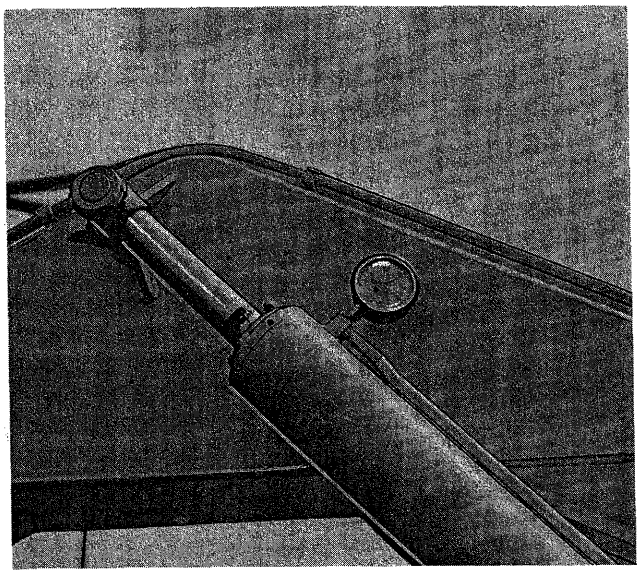


Figure 13. Pressure Gage Installed in Boom Cylinder Testing Port

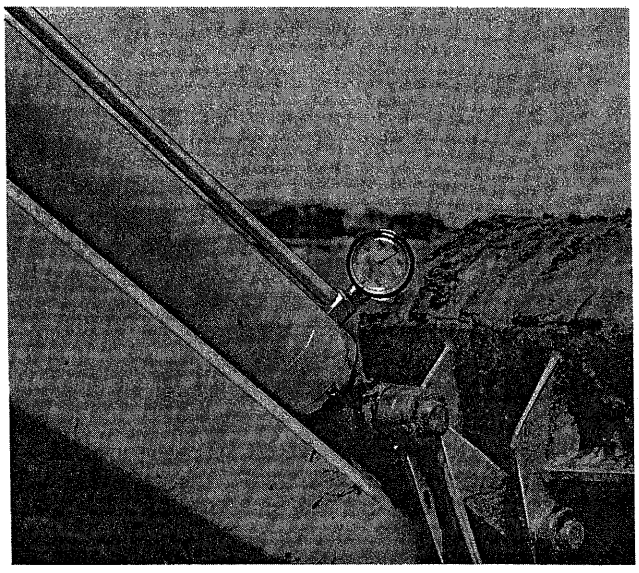


Figure 14. Pressure Gage Installed in Bucket Cylinder Testing Port

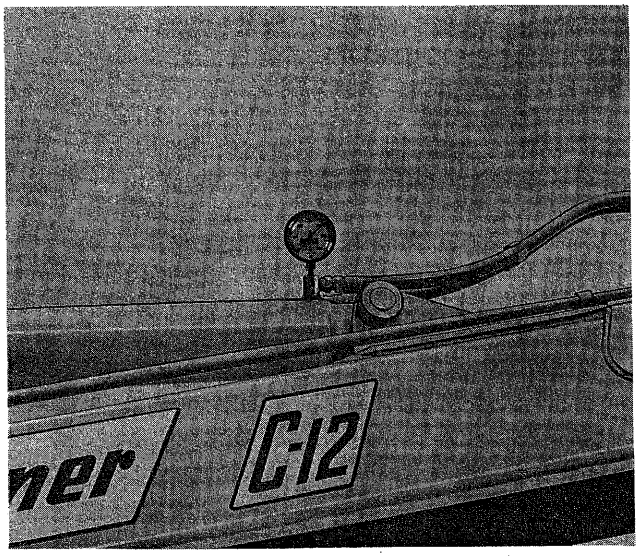


Figure 15. Pressure Gage Installed in Dipstick Cylinder Testing Port

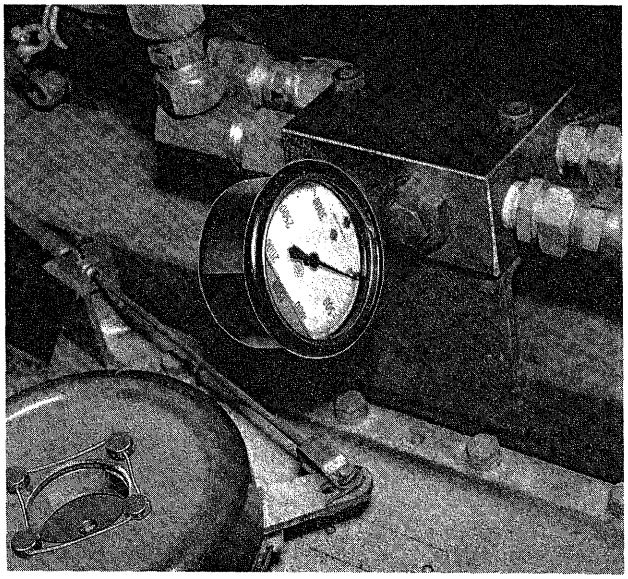


Figure 16. Pressure Gage Installed in Propel Circuit Cross-over Relief Valve

brake on each propel gear box. The adjusting procedures are identical for both propel and swing brake assemblies.

The brakes can be adjusted at three points:

1. In the handle itself.
2. At either end of the conduit.
3. At the gear box connection.

The swing, and propel, brake is a static brake only. Therefore, the amount of wear should be very small. However, if the brakes do need adjusting, proceed as follows:

1. Make the initial adjustment in the handle itself, by turning the knurled adjusting knob at the tip of the handle until the handle "snaps" into an overcenter lock position when pulled up.

2. If for some reason the adjustment can not sufficiently be made in the handle, make the remaining adjustment at either of the other two points.

3-11. TOOL KITS.

The tool kit for the carrier mounted machines (Figure 18) includes the tools necessary for all maintenance and adjustments of the upperstructure.

The tool kit supplied with crawler mounted machines (Figure 19) includes the tools for the upperstructure plus the extra tools necessary for adjustments and maintenance of the crawler. This kit also includes shims and groove pins for the crawler tracks.

3-12. GEAR BOX REMOVAL.

To remove the propel gear box, swing the boom over the side frame which is to be removed. Disconnect the safety chain from the carbody. Raise and block the machine as described in paragraph 2-1 and Figure 5. Disconnect the hydraulic lines from the propel motor, remove the brake cable and mounting bracket from the gear box. Disconnect the four locking bolts which attach the side frame to the carbody cross tubes. Attach chain as shown in Figure 5 and pull the entire side frame off. The side frame assembly can now be tipped flat to facilitate the removal of the drive chain and gear box. The swing gear box is easily removed by unscrewing the four retaining nuts and lifting off the gear box.

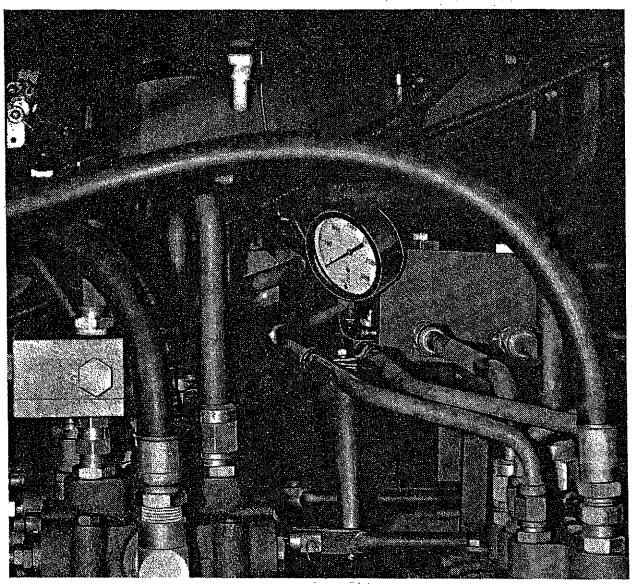
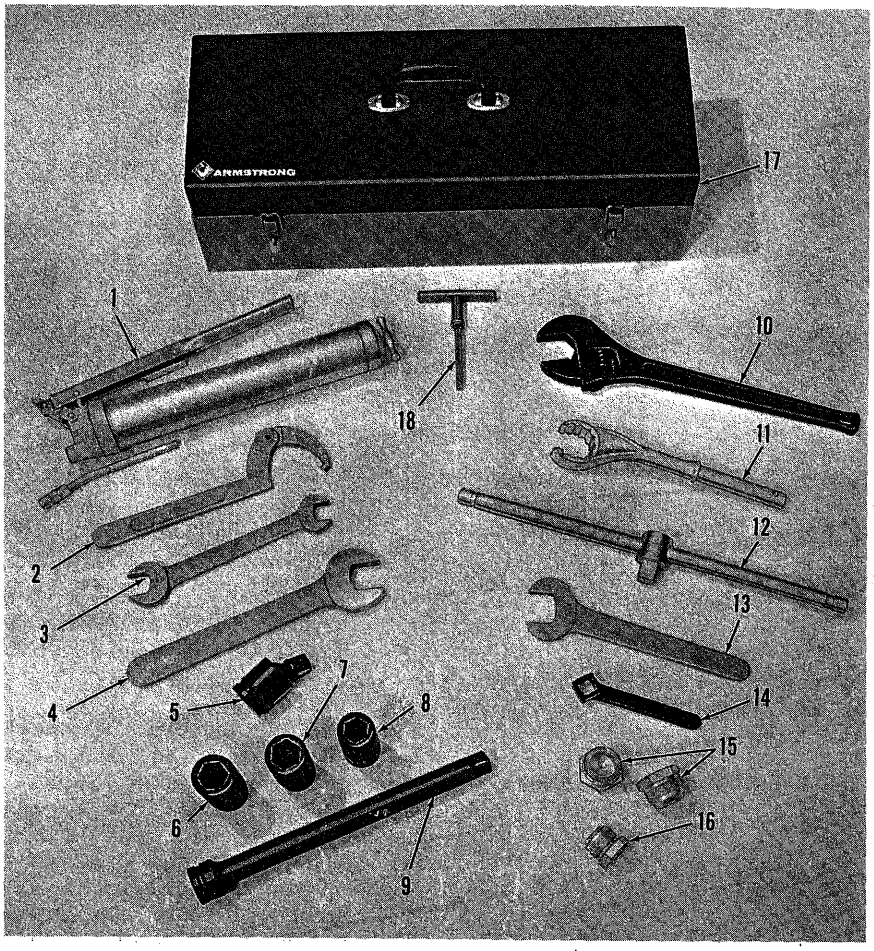


Figure 17. Pressure Gage Installed in Swing Circuit Pressure Compensating Unit Testing Port



1. Grease Gun
2. Spanner Wrench - Cylinder Heads
3. Open End Wrench, 7/8" and 1"
4. Open End Wrench, 1-1/4"
5. Universal Joint, 3/4" Drive
6. Socket, 1-1/16", Deep Throat 3/4" Drive
7. Socket, 1-1/8", Deep Throat 3/4" Drive
8. Socket, 15/16", Standard 3/4" Drive
9. Extension, 12", 3/4" Drive
10. Crescent Wrench, 15"
11. Special Tube Wrench, 1-1/2"
12. Sliding "T" Handle, 3/4" Drive
13. Open End Wrench, 3/8"
14. Drain Valve Handle - Oil Reservoir
15. Plugs, 1-1/4" - Supply Lines (2)
16. Plug, 1" - Supply Lines
17. Tool Box
18. Tee Handle - Machinery Housing Doors

Figure 18. Tool Kit — Carrier Mounted Machine

3-13. PROPEL AND SWING GEAR BOX REPAIR.

The gear boxes are of relatively simple construction and therefore detailed disassembly and repair instructions are not necessary. However, for ease of disassembly and repair, and also to guard against unnecessary damage to the gear box components, we recommend that the following list of general hints and precautions be followed:

NOTE

Use only genuine Hein-Werner parts to insure proper fit and operation.

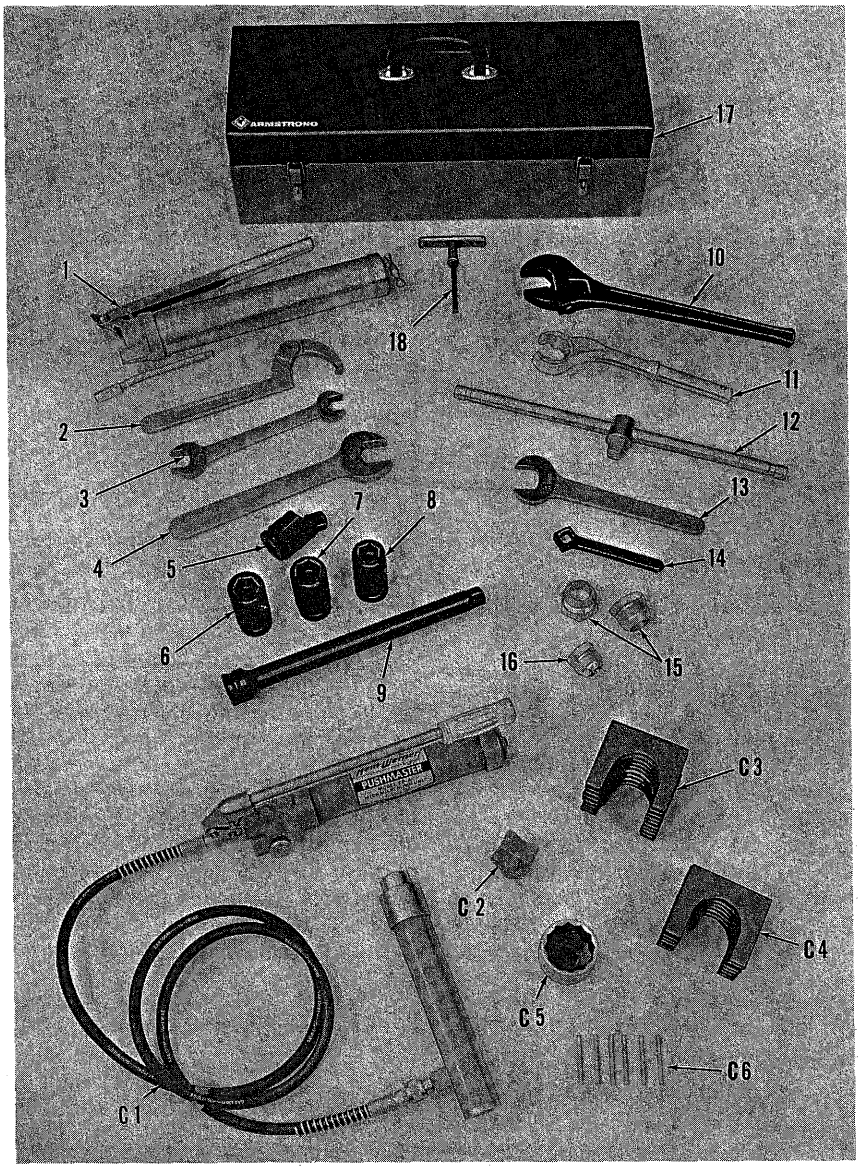
1. Use a soft hammer when assembling or disassembling any parts which may become nicked or marred.

2. Use a press wherever possible to remove and replace gears and bearings.

3. Use care when removing seals and bearing cups to avoid damaging the case, or cover, in which the components are seated.

4. Replace hex nuts and bolts with rounded corners, all lockwashers, oil seals and gaskets.

5. Clean the threads of all bolts, studs, and nuts to assure proper torque and adjustment.



Upperstructure Tools

1. Grease Gun
2. Spanner Wrench - Cylinder Heads
3. Open End Wrench, 7/8" and 1"
4. Open End Wrench, 1-1/4"
5. Universal Joint, 3/4" Drive
6. Socket, 1-1/16", Deep Throat 3/4" Drive
7. Socket, 1-1/8", Deep Throat 3/4" Drive
8. Socket, 15/16", Standard 3/4" Drive
9. Extension, 12", 3/4" Drive
10. Crescent Wrench, 15"
11. Tube Wrench, 1-1/2" Special
12. Sliding "T" Handle, 3/4" Drive
13. Open End Wrench, 3/8"
14. Drain Valve Handle - Oil Reservoir
15. Plugs, 1-1/4" - Supply Lines (2)
16. Plug, 1" - Supply Lines
17. Tool Box
18. Tee Handle - Machinery Housing Doors

Crawler Tools

C1. Hein-Werner Pushmaster Unit - Track Adjustment
C2. Chain Adapter - Sprocket Removal
C3. Track Adjusting Shims, 1/4" (16)
C4. Track Adjusting Shims, 1/8" (20)
C5. Socket, 1-5/16", Standard 3/4" Drive
C6. Track Shoe Groove Pins (6)

Figure 19. Tool Kit — Crawler Mounted Machine

6. Carefully clean and inspect all parts for signs of wear or future failure.

3-14. SHAFT BEARING ADJUSTMENT.

The intermediate shaft bearings are adjusted by means of shims under the shaft cover. Use shims as required to obtain .002 inch end play, to .002 inch preload on the bearing. The output shaft bearings are adjusted by positioning the nut on the upper end of the shaft. Tighten and secure nut as required to obtain .002 inch end play to .002 inch bearing preload. Pack the grease cavity of the shaft covers with Mobil #5 grease or equivalent.

3-15. GEAR BOX REPLACEMENT.

No adjustment is necessary when replacing the swing gear box. When the gear box is in position on the mounting studs, the output pinion is in correct mesh with the swing bearing.

Install the propel box and adjust the drive chain (see paragraph 3-7) while the side frame is removed.

Tip the side frame back to the normal position by inserting the bucket teeth below the track shoes and tucking the bucket. Replace the side frame on the carbody cross tube by inserting a large pipe or timber between the bucket and the side frame and, using the dipstick, carefully push the side frames back in position. Replace the four locking bolts which hold the side frame to the carbody cross tubes. Connect the safety chain, brake cable and bracket, and the hydraulic lines.

To refill propel gear box, remove the top filler plug and fill the gear box with EP 80-90 oil until the oil begins to run out the upper level checking plug located at the side of the gear box. Replace the plugs and check the gear box for oil leaks.

Table 4. Torque Values

Description	Torque
Gear Box intermediate shaft cover bolts	106 - 113 ft. lbs.
Gear Box output shaft cover bolts	69 - 73 ft. lbs.
Gear Box cover to case bolts	106 - 113 ft. lbs.
Swing bearing to bearing adapter and platform bolts	200 ft. lbs.
Swing bearing adapter to carbody bolts	300 ft. lbs.
Carbody to cross tube bolts	556 ft. lbs.

3-16. HYDRAULIC CYLINDER REPAIR.

Cylinder repair kits contain ram head and cylinder rod O-rings, rod packings and wiper, piston rings and rod nut. Use all parts of the repair kit when a cylinder is repaired, even though some of the parts being replaced may not appear to be worn. It is not necessary to remove a cylinder assembly from the unit in order to repair it with a cylinder repair kit, but be extremely careful to prevent the entry of any dirt or foreign particles into the cylinder. Proceed as follows to service a cylinder:

NOTE

Use only factory approved parts to insure proper fit and operation.

1. Use the spanner wrench supplied in the tool kit to remove the cylinder ram head.

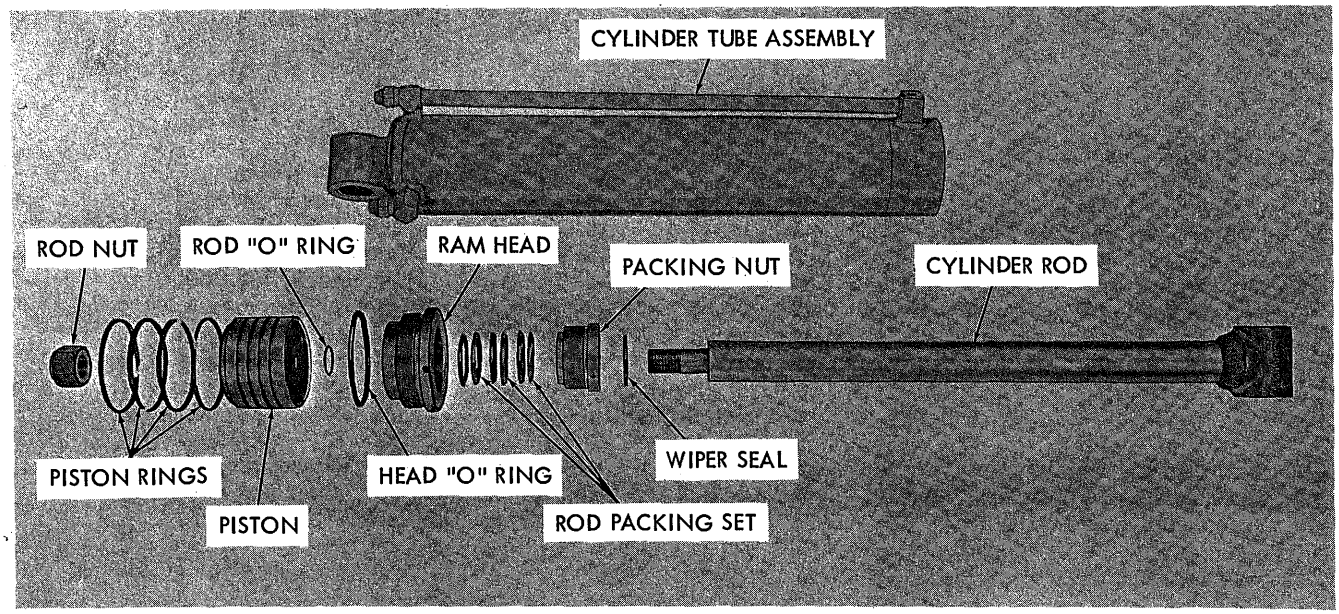


Figure 20. Hydraulic Cylinder Disassembly

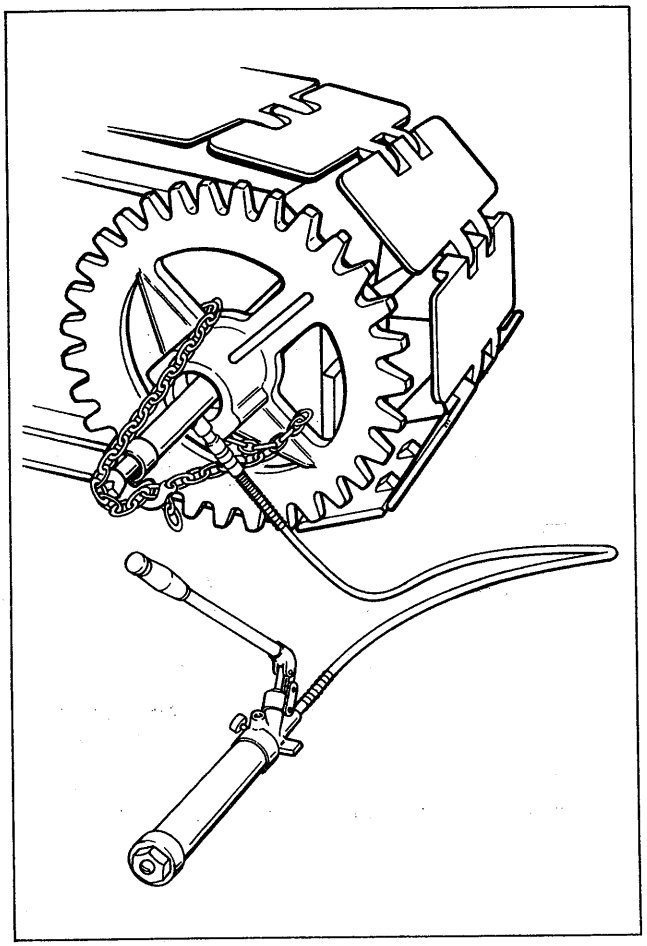


Figure 21. Removing the Crawler Drive Sprocket

2. Pivot the cylinder to allow clearance for removing the cylinder rod and piston assembly.

3. Remove hoses from base end of cylinder to release any suction. Remove rod assembly from cylinder tubes.

4. Disassemble the cylinder rod and piston assembly as indicated in Figure 20. Replace packings, piston rings, O-rings, wiper seal, and rod nut. Lubricate all parts with hydraulic oil. Reassemble the cylinder rod and piston assembly.

5. Replace the cylinder rod and piston assembly in the cylinder and screw the ram head into the end of the cylinder until it is tight. Replace hoses.

6. Slowly pivot the cylinder into position. Use control lever to apply slight hydraulic pressure to align the rod end with the cylinder rod end pivot point.

7. Insert the pivot pin. Lock the pivot pin in place.

8. Use the control levers to slowly apply hydraulic pressure alternately to both ends of the repaired cylinder until the cylinder is completely filled with oil.

9. After 4 to 8 hours of operation with a cylinder which has been repacked, tighten the cylinder packing nut to prevent excessive escape of hydraulic oil around the cylinder rods. Do not overtighten as a small seepage of oil at this point is necessary for cylinder rod lubrication. The packing nut should be tightened snug, and then backed off 1/4 to 1/2 turn for the proper setting.

3-17. CRAWLER DRIVE SPROCKET REMOVAL.

Use the Pushmaster Unit supplied with the crawler tool kit to remove the crawler drive sprocket. Attach a chain to the sprocket as shown in Figure 21. Replace the standard Pushmaster head with the 90° concave head adapter. Remove the shaft end plate. Install the Pushmaster as shown and pull the sprocket out until the drive chain will clear the track shoes. The drive chain can now be removed and the sprocket pulled completely off.

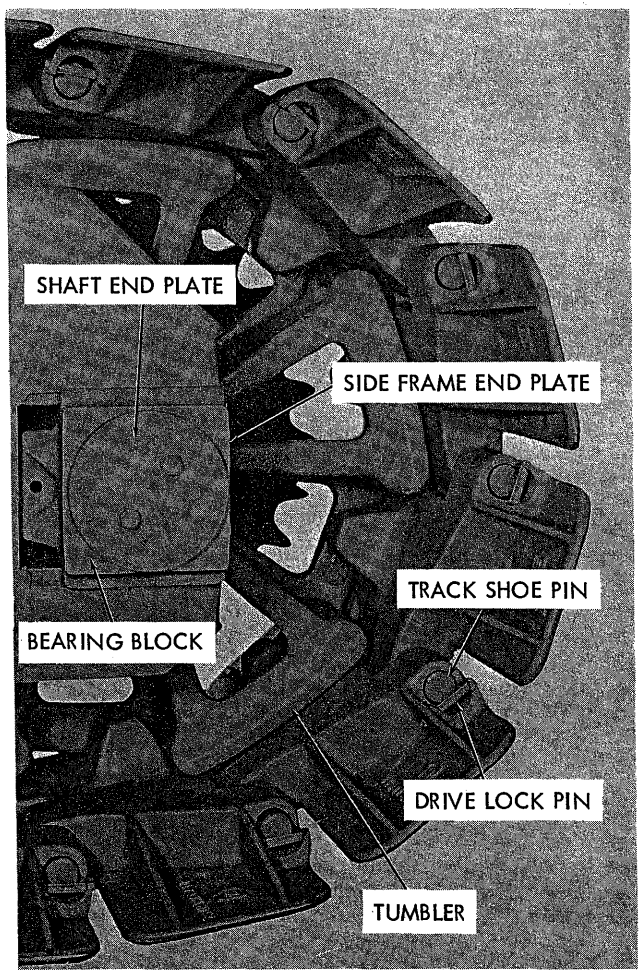


Figure 22. Removing Idler or Tumbler Bearing Blocks

3-18. TUMBLER OR IDLER SHAFT BUSHING, THRUST WASHER, AND SEAL REPLACEMENT.

To replace the shaft bushings, thrust washers, and seals, loosen the track by removing all adjusting shims. (See paragraph 3-8.) To remove either the idler or tumbler bearing blocks, remove track shoe pin (Figure 22) by driving out first the drive lock pin shown and then the track shoe pin from the opposite side. If the tumbler is to be removed, the drive chain must also be disconnected. Remove the side frame end plate and then the tumbler or idler and shaft assembly. Next remove the shaft, the shaft end plate, and the bearing blocks. When replacing bushings and seals, press the bushings in and install the seal in a reverse position (Figure 23) to allow the bushing to be "flushed" of dirt when being greased.

Reassemble the thrust washers and bearing blocks to the shaft. (See Figures 41 and 42). To adjust the shaft end plate clearance, bolt one end plate tight. Add shims as required to obtain .020-.030 inch total clearance between the bearing block and the shaft end plate. When shimming the tumbler end, place the shims on the drive sprocket end of the shaft. Adjust the idler at either end of the shaft. Replace the shaft and tumbler or idler assembly in the side frame by reversing the disassembly procedure. Adjust the track as instructed in paragraph 3-8.

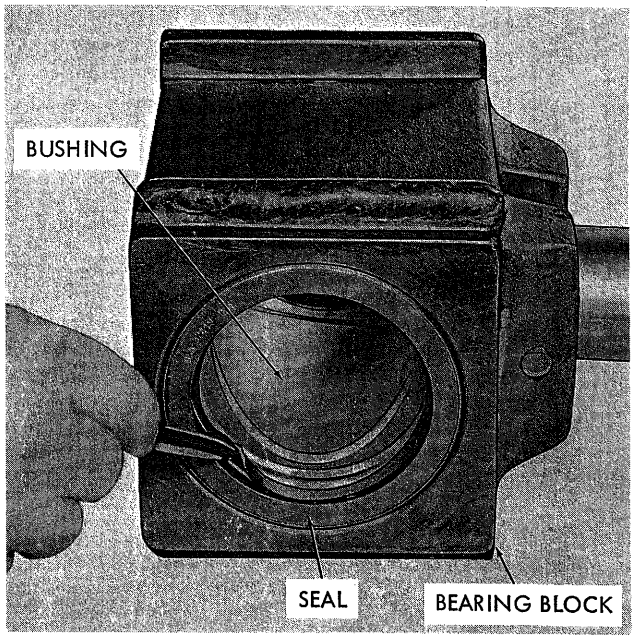


Figure 23. Replacing Bushings and Seals

SECTION IV

REPAIR PARTS LIST

When ordering parts, always give the model number, machine serial number, and engine serial number as shown on the Serial Number Plate (Figure 24). All part numbers preceded by an asterisk (*) in the following lists are dealer-serviced assemblies. Contact your dealer for information concerning these parts. When ordering parts for engine drive packages, engine mounting packages, or any other assemblies for which part numbers are not listed, include the name of the part and the make of the engine in addition to the above information.

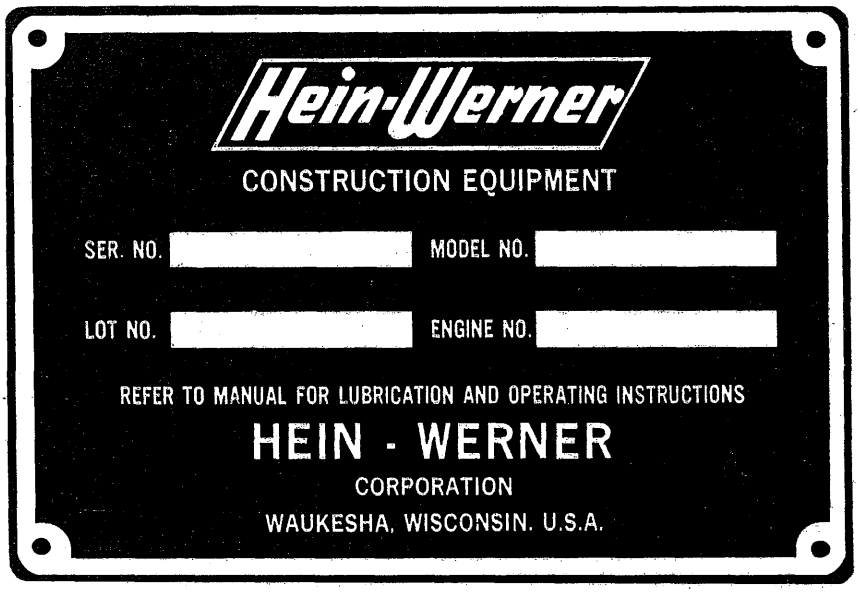


Figure 24. Serial Number Plate

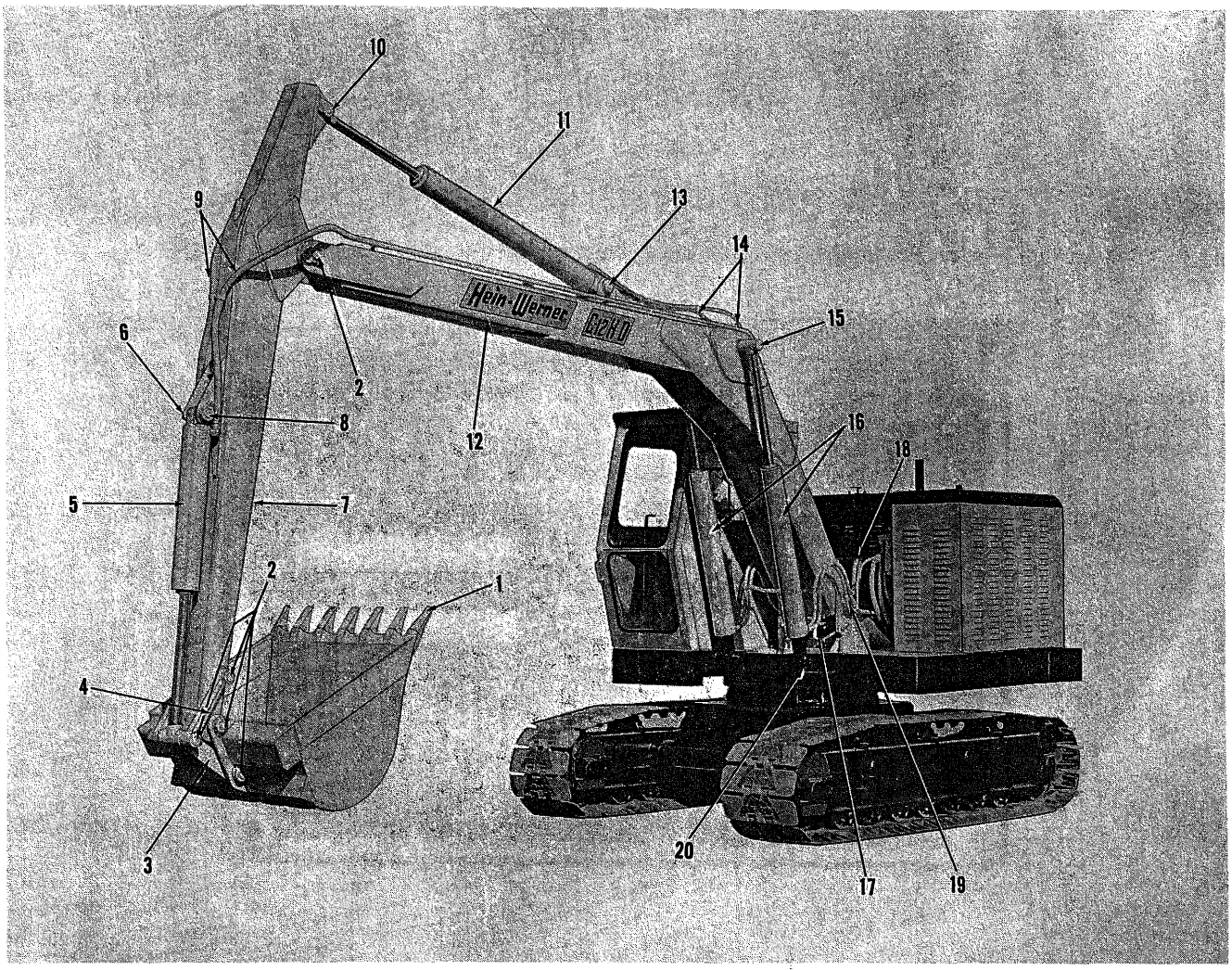


Figure 25. Boom, Bucket and Dipstick

BOOM, BUCKET AND DIPSTICK

Index Number	Part Number	Description	Quantity
1	400033	Bucket Tooth Point	as reqd
	400034	Bucket Tooth Shank	as reqd
	400035	Bucket Tooth Pin	as reqd
2	210024	Bucket and Linkage Pin	5
3	150003	Bucket Link Assembly	1
4	140027	Bell Crank Link Assembly	2
	220028	Bell Crank Bushing - Not Grooved	2
	220027	Bell Crank Bushing - Grooved	2
5	040100	Bucket Cylinder Assembly	1
6	400018	Lock Pin	14
	400026	Cotter Pin	14
7	110045	Dipstick (C-10-1, T-10-1)	1
	110045	Dipstick (C-10-1HD, T-10-1HD)	1
	110052	Dipstick (T-12-1, C-12-1HD)	1
	220028	Dipstick Pivot Bushing	6
8	210002	Bucket Cylinder Base Pin	1
9	030039	Bucket Cylinder Hose (C-10-1, T-10-1)	2
	030039	Bucket Cylinder Hose (C-10-1HD, T-10-1HD)	2
	030166	Bucket Cylinder Hose (T-12-1, C-12-1HD)	2
10	210002	Dipstick Rod Pin	1
11	040098	Dipstick Cylinder	1
12	100006	Boom Assembly (C-10-1, T-10-1)	1
	100081	Boom Assembly (C-10-1HD, T-10-1HD)	1
	100081	Boom Assembly (T-12-1, C-12-1HD)	1
	030022	Boom Tube - Outer	2
	030023	Boom Tube - Inner	2
	030024	Boom Tube - To Bucket Cylinder Hose (C-10-1, T-10-1)	2
	030162	Boom Tube - To Bucket Cylinder Hose (C-10-1HD, T-10-1HD)	2
	030162	Boom Tube - To Bucket Cylinder Hose (C-10-1HD, T-10-1HD)	2
	400254	Boom Double Tube Clamps (Top and Bottom)	6
	400043	Boom Single Tube Clamps	6
	220000	Boom and Dipstick Pivot Bushing	8
13	210028	Dipstick Cylinder Base Pin	1
14	030036	Dipstick Cylinder Hose (C-10-1, T-10-1)	2
	030164	Dipstick Cylinder Hose (C-10-1HD, T-10-1HD)	2
	030164	Dipstick Cylinder Hose (C-12-1HD, T-12-1)	2
15	210003	Boom Lift Pin	1
	210004	Boom Lift Pin Collar	1
16	040101	Boom Cylinder Assembly (C-10-1, T-10-1)	2
	040102	Boom Cylinder Assembly (C-10-1HD, T-10-1HD)	2
	040102	Boom Cylinder Assembly (C-12-1HD, T-12-1)	2
17	030038	Boom Cylinder Hose	4
18	030036	Boom Foot Hose	4
19	210027	Boom Foot Pin	1
20	210002	Boom Cylinder Base Pin	2
	400015	Grease Fitting	9

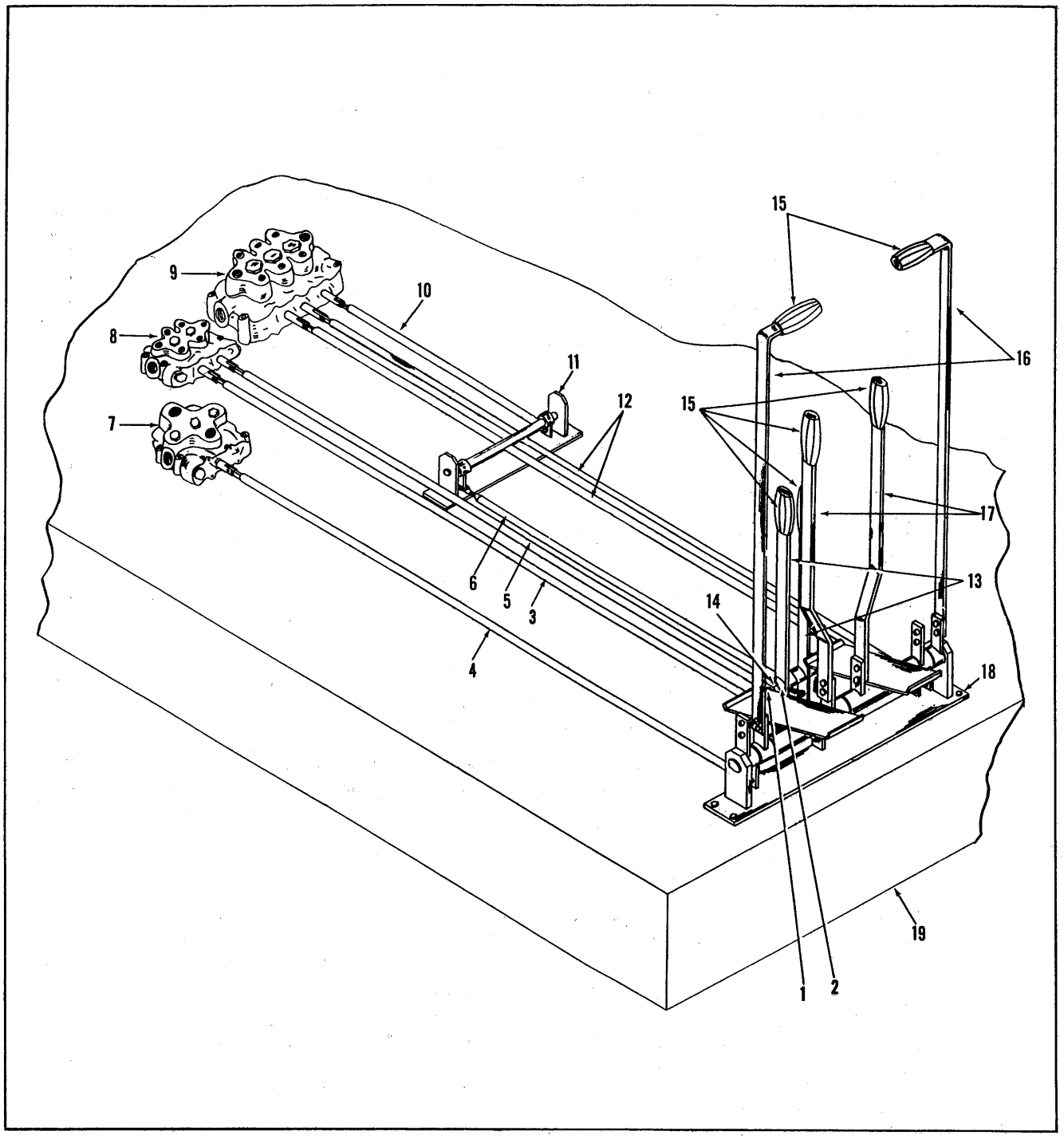


Figure 26. Machinery Platform and Controls

Index Number	Part Number	Description	Quantity
		MACHINERY PLATFORM AND CONTROLS	
1	330024	Shaft	1
2	330023	Spacer	2
3	330140	Control Rod	1
4	330077	Control Rod	1
5	330141	Control Rod	1
6	330080	Control Rod	1
*7	000025	Control Valve - Single Spool	1
*8	000033	Control Valve - Two Spool	1
*9	000032	Control Valve - Three Spool	1
10	330142	Control Rod	1
11	330068	Control Shaft Assembly	1
12	330139	Control Rod	2
13	330059	Travel Lever or Outrigger Lever	2
14	330028	Base	1
15	120039	Handle Grip	6
16	330042	Boom and Swing Lever	2
17	330070	Bucket and Dipstick Lever	2
18	330017	Control Base Assembly	1
19	120176	Machinery Platform	1

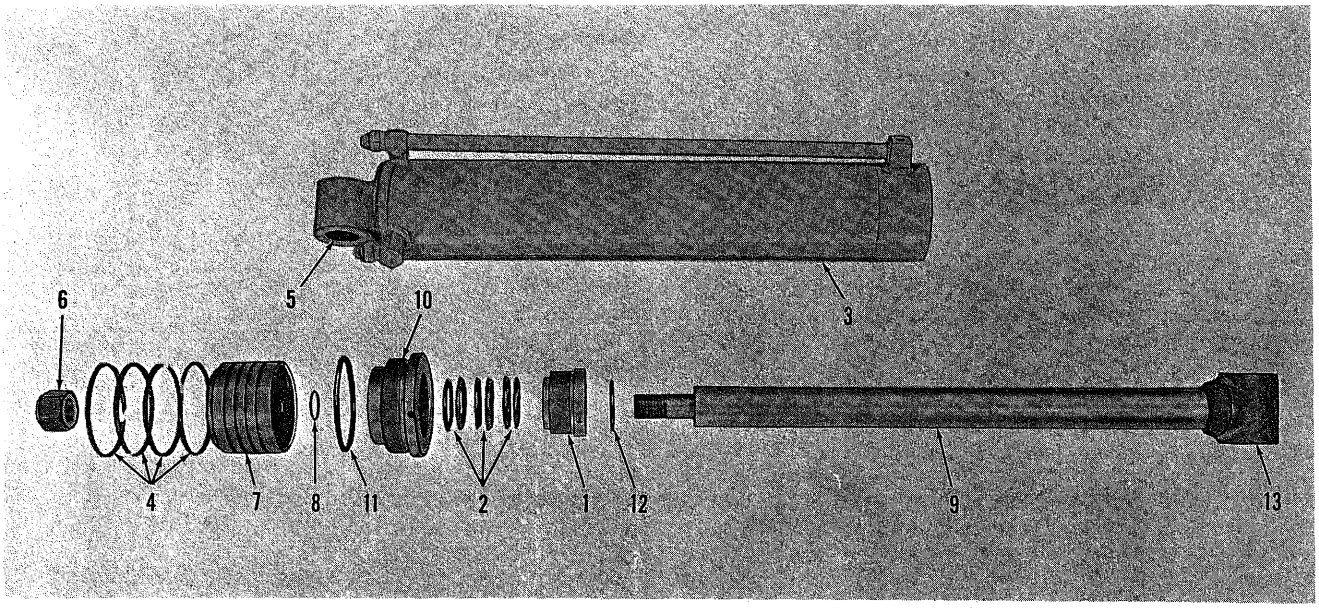


Figure 27. Typical Cylinder Assembly

Index Number	Part Number	Description	Quantity
		BUCKET CYLINDER ASSEMBLY (040100)	
1	040090	Packing Nut	1
2	010032	Rod Packing Set	1
3	040041	Cylinder Tube	1
4	010027	Piston Ring	4
5	220000	Bushing	2
6	400011	Nut	1
7	040080	Piston	1
8	010013	O-Ring	1
9	040032	Rod	1
10	040091	Ram Head	1
11	010014	O-Ring	1
12	010010	Wiper Seal	1
13	220026	Bushing	2
		DIPSTICK CYLINDER ASSEMBLY (040098)	
1	040090	Packing Nut	1
2	010032	Rod Packing Set	1
3	040044	Cylinder Tube	1
4	010027	Piston Ring	4
5	220000	Bushing	4
6	400011	Nut	1
7	040080	Piston	1
8	010013	O-Ring	1
9	040030	Rod	1
10	040091	Ram Head	1
11	010014	O-Ring	1
12	010010	Wiper Seal	1

Index Number	Part Number	Description	Quantity
		OUTRIGGER CYLINDER ASSEMBLY (040099)	
1	040090	Packing Nut	1
2	010032	Rod Packing Set	1
3	040043	Cylinder Tube	1
4	010027	Piston Ring	4
5	220000	Bushing	4
6	400011	Rod Nut	1
7	040080	Piston	1
8	010013	O-Ring	1
9	040018	Rod	1
10	040091	Ram Head	1
11	010014	O-Ring	1
12	010010	Wiper Seal	1
		BOOM CYLINDER ASSEMBLY - 4 INCH (040101)	
1	040082	Packing Nut	1
2	010033	Rod Packing Set	1
3	040042	Cylinder Tube	1
4	010026	Piston Ring	4
5	220000	Bushing	4
6	400012	Nut	1
7	040081	Piston	1
8	010011	O-Ring	1
9	040031	Rod	1
10	040083	Ram Head	1
11	010012	O-Ring	1
12	010009	Wiper Seal	1
		BOOM CYLINDER ASSEMBLY - 5-1/4 INCH (040102)	
1	040090	Packing Nut	1
2	010032	Rod Packing Set	1
3	040063	Cylinder Tube	1
4	010027	Piston Ring	4
5	220000	Bushing	4
6	400011	Nut	1
7	040080	Piston	1
8	010013	O-Ring	1
9	040058	Rod	1
10	040091	Ram Head	1
11	010014	O-Ring	1
12	010010	Wiper Seal	1

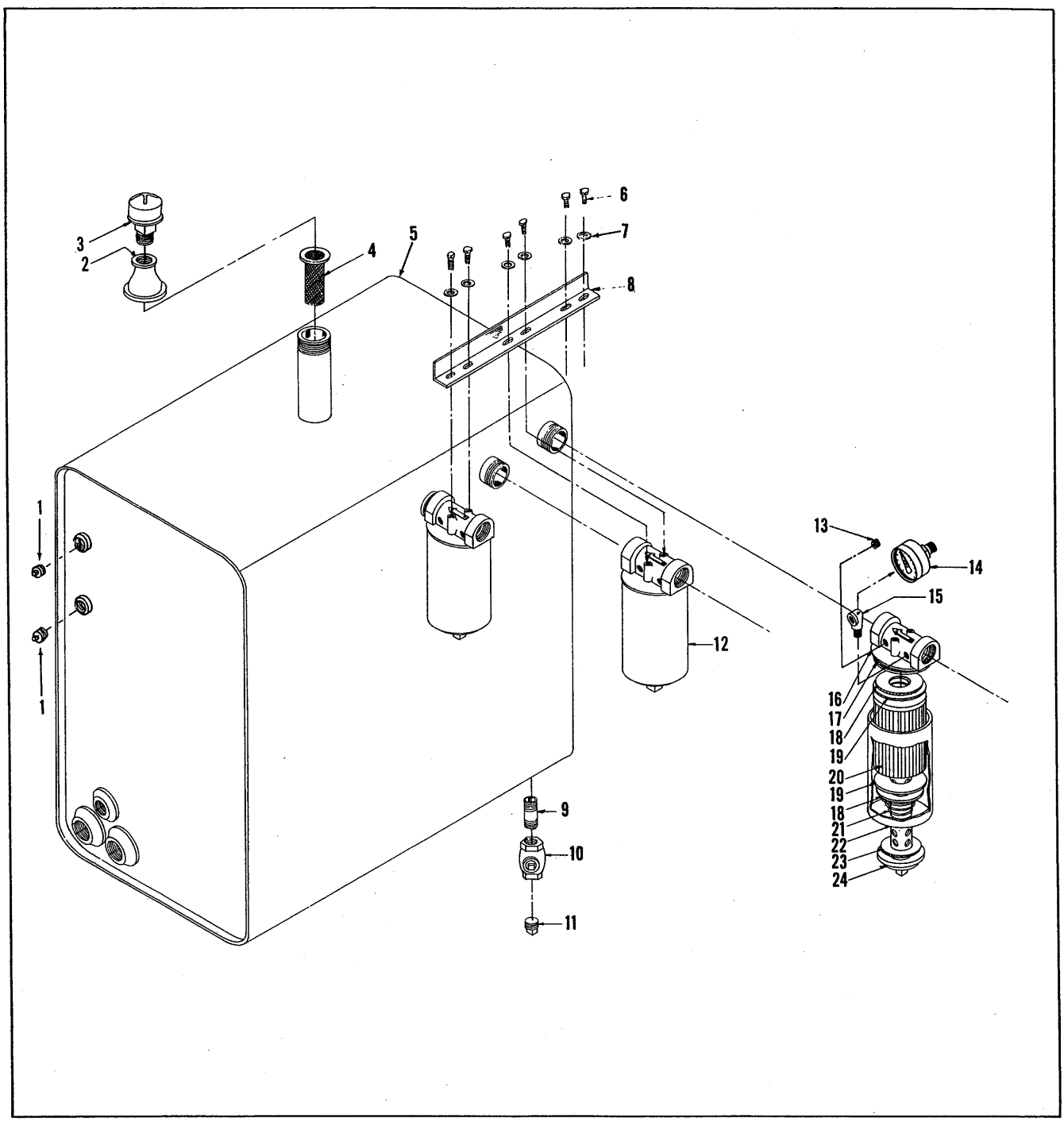


Figure 28. Hydraulic Reservoir and Filters

Index Number	Part Number	Description	Quantity
		HYDRAULIC RESERVOIR AND FILTERS	
1	020101	Plug	2
2	020151	Reducer	1
3	240013	Breather Cap	1
4	400251	Screen	1
5	050006	Reservoir	1
6	400222	Cap Screw	6
7	400223	Washer	6
8	120218	Angle	1
	400228	Pump Supply Lines Hose Clamp	4
9	030182	Nipple	1
10	000019	Drain Valve	1
	400200	Drain Valve Handle	1
11	020105	Pipe Plug	1
12	050007	Filter Assembly	3
13	015	Plug	3
14	1568	Backpressure Gage	3
15	020163	Street Ell	3
16	1560	Head	1
17	1576	O-Ring	1
18	1564	Backup Washer	2
19	1565	Gasket	2
20	1566	Element - Cleanable	1
	1567	Element - Disposable	1
21	1563	Spring	1
22	1562	Housing	1
23	1575	Center Post Seal	1
24	1561	Center Post	1

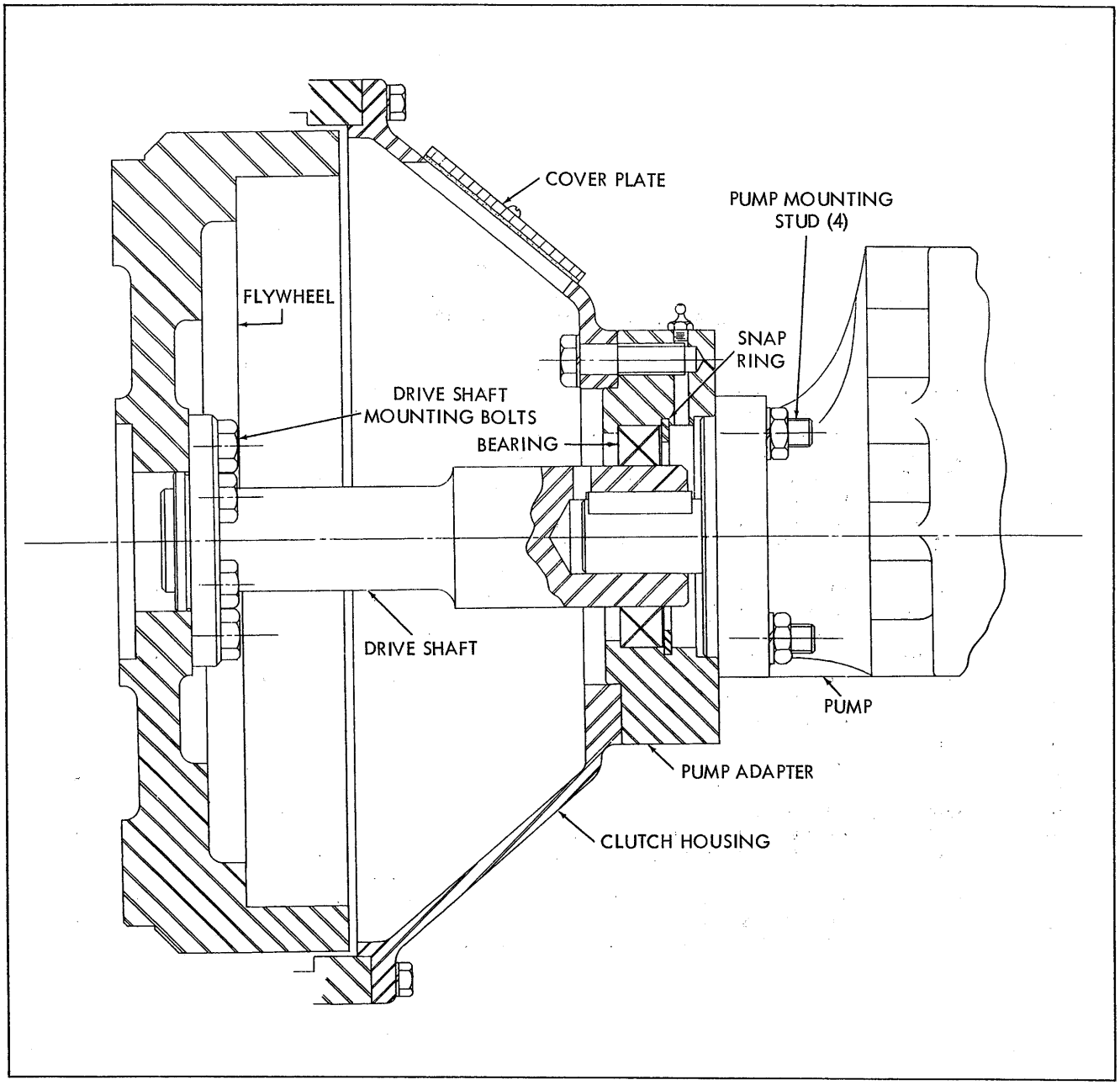


Figure 29. Typical Pump Drive

Index Number	Part Number	Description	Quantity
		SWING BRAKE INSTALLATION (NOT ILLUSTRATED)	
	230087	Brake Handle Mounting Bracket	1
	230093	Brake Cable Mounting Bracket - Gear Box	1
	230090	Brake Cable	1
	230091	Brake Handle Assembly	1
		HYDRA-SWIVEL ASSEMBLY - CRAWLER (NOT ILLUSTRATED)	
	020206	Tee - Drain Lines	1
	030245	Hydraulic Tube - Upper Ports	2
	020198	Connector - Top Body Ports	4
	030244	Hydraulic Tube - Lower Ports	2
	010036	O-Ring	6
	040105	Hydra-swivel Body	1
	040104	Hydra-swivel Housing	1
	040107	End Cap	1
		HYDRA-SWIVEL ASSEMBLY - TRUCK (NOT ILLUSTRATED)	
	020198	Connector - Top Ports	4
	040105	Hydra-swivel Body	1
	010036	O-Ring	6
	020101	Plug	1
	040104	Hydra-swivel Housing	1
	040107	End Plate	1
	030252	Tube - Lower Ports	2
	030251	Tube - Upper Ports	2
	020158	Elbow	4

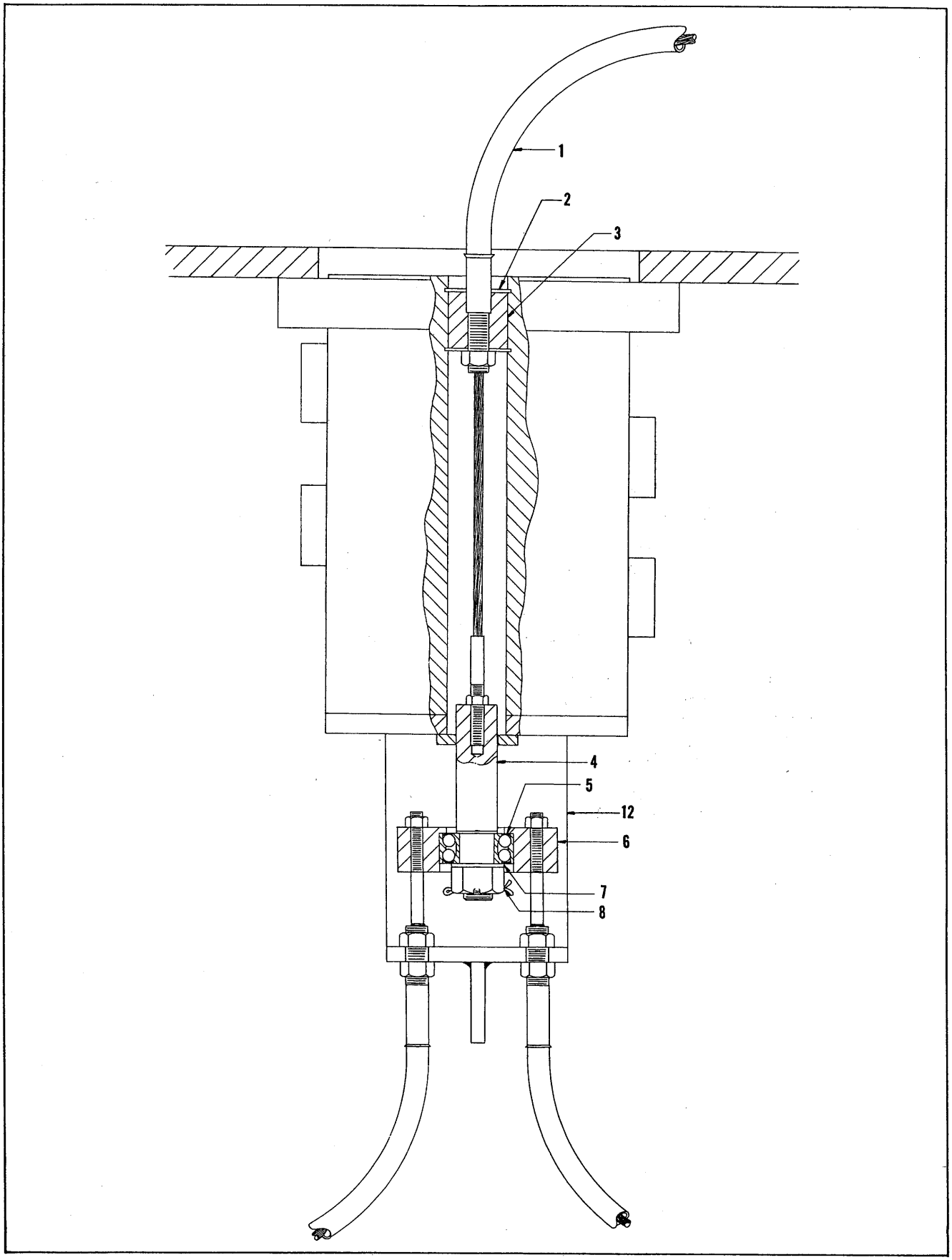


Figure 30. Propel Brake Installation (Sheet 1)

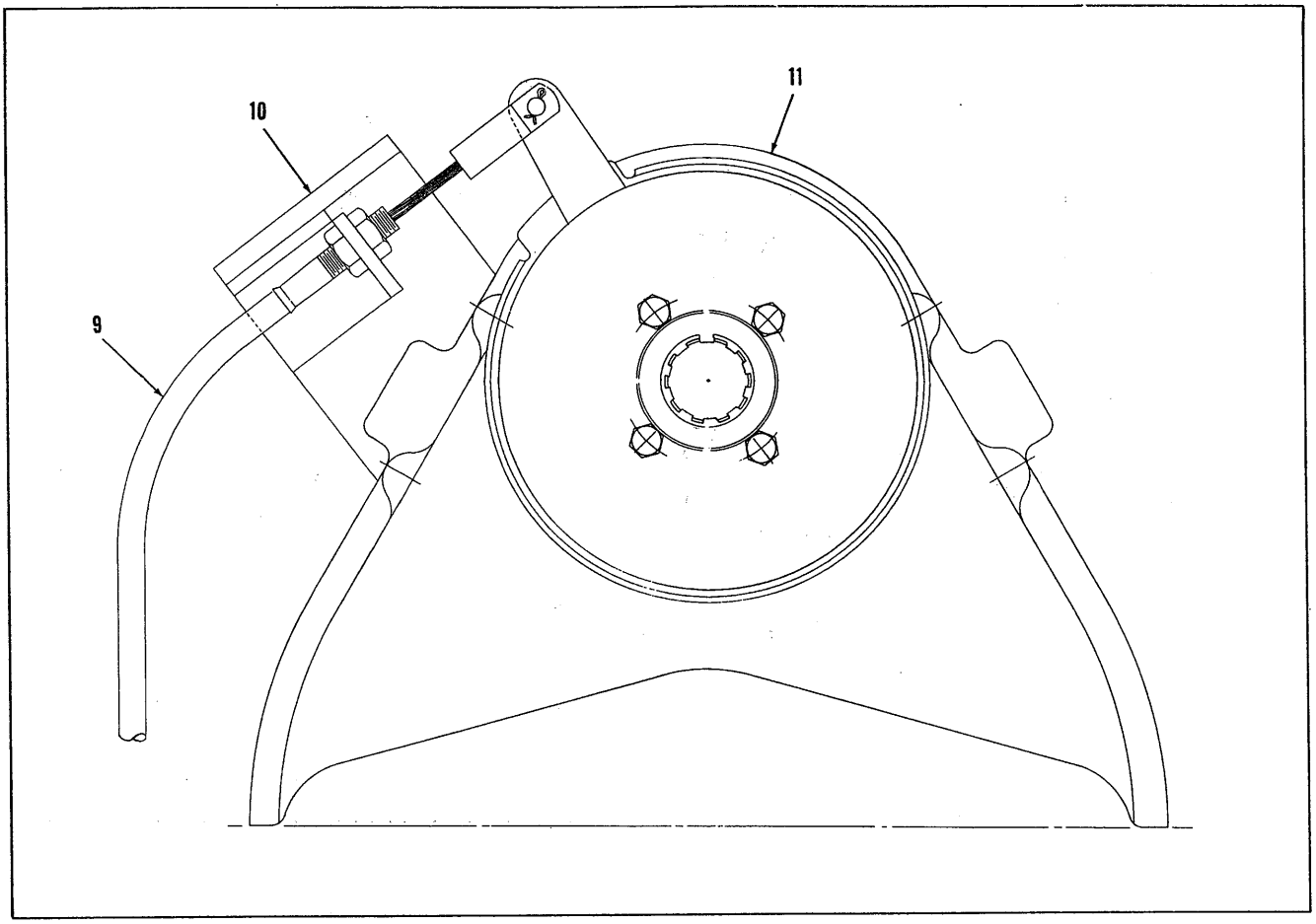
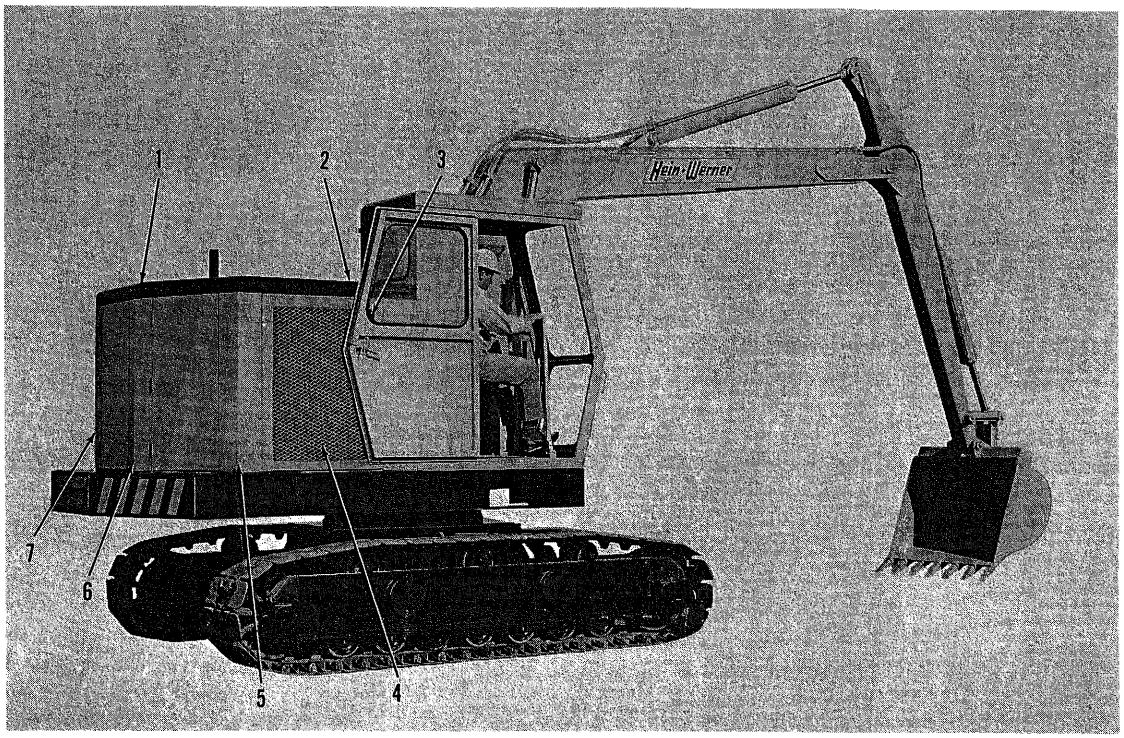


Figure 30. Propel Brake Installation (Sheet 2)

Index Number	Part Number	Description	Quantity
		PROPEL BRAKE INSTALLATION	
1	230107	Upper Brake Cable	1
2	400290	Snap Ring	2
3	230103	Block - Brake Cable	1
4	230102	Bearing Mount	1
5	220044	Bearing	1
6	230104	Equalizer	1
7	220046	Bearing Washer	1
8	400182	Bearing Nut	1
9	230113	Cable - Lower	2
10	230118	Propel Gear Box Bracket, RH	1
	230117	Propel Gear Box Bracket, LH	1
11	240057	Propel Gear Box, RH	1
	240056	Propel Gear Box, LH	1
12	230101	Cable Mounting Bracket - Turntable	1
13	230091	Brake Handle Assembly	1
14	230087	Brake Handle Mounting Bracket	1



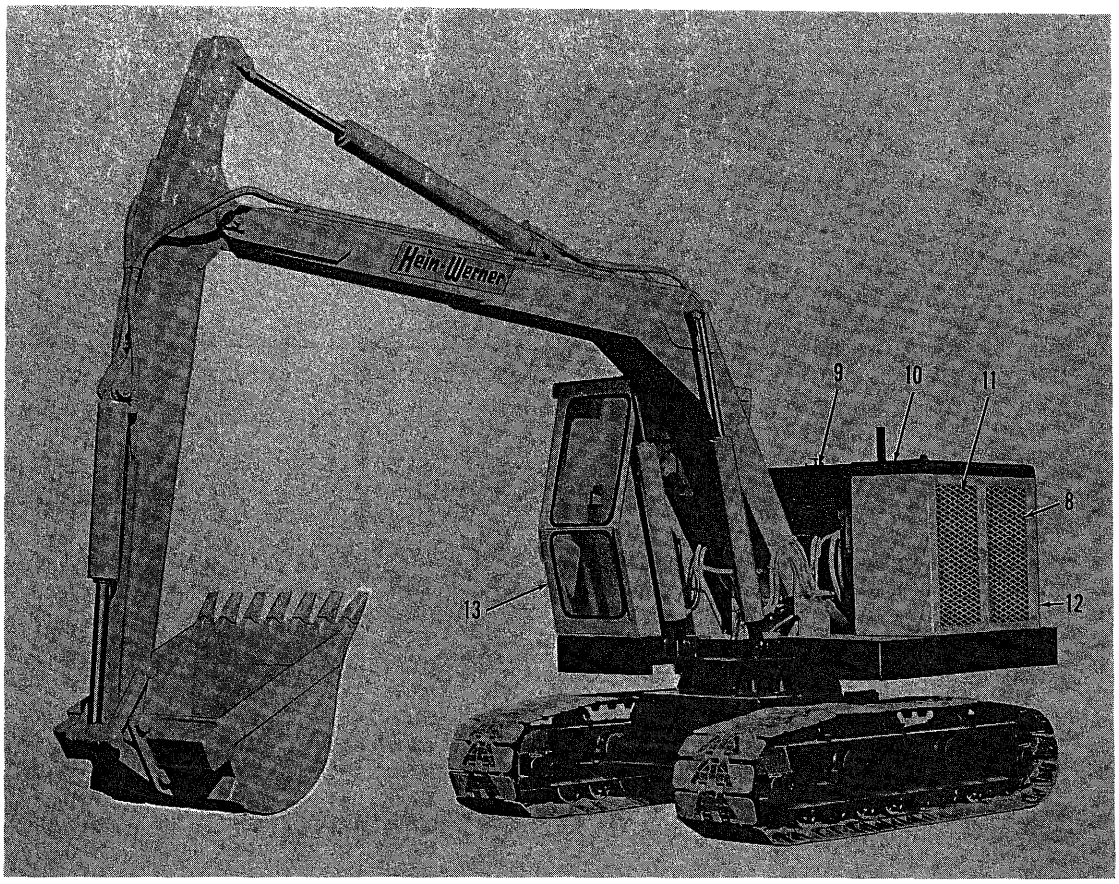


Figure 31. Machinery Housing and Cab

Index Number	Part Number	Description	Quantity
		MACHINERY HOUSING AND CAB	
1	120230	Top Section - Rear	1
2	120232	Top Section - R. H. Front	1
3	120238	End Panel - R. H.	1
4	120240	Side Door	1
5	120237	End Post - R. H.	1
6	120236	Rear Post - R. H.	1
7	120235	Rear Post - L. H.	1
8	120239	Rear and L. H. Door	4
9	120233	Top Access Door	1
10	120231	Top Assembly	1
11	120234	End Panel - L. H.	1
12	120283	End Post - L. H.	1
13	120281	Cab - Complete	1

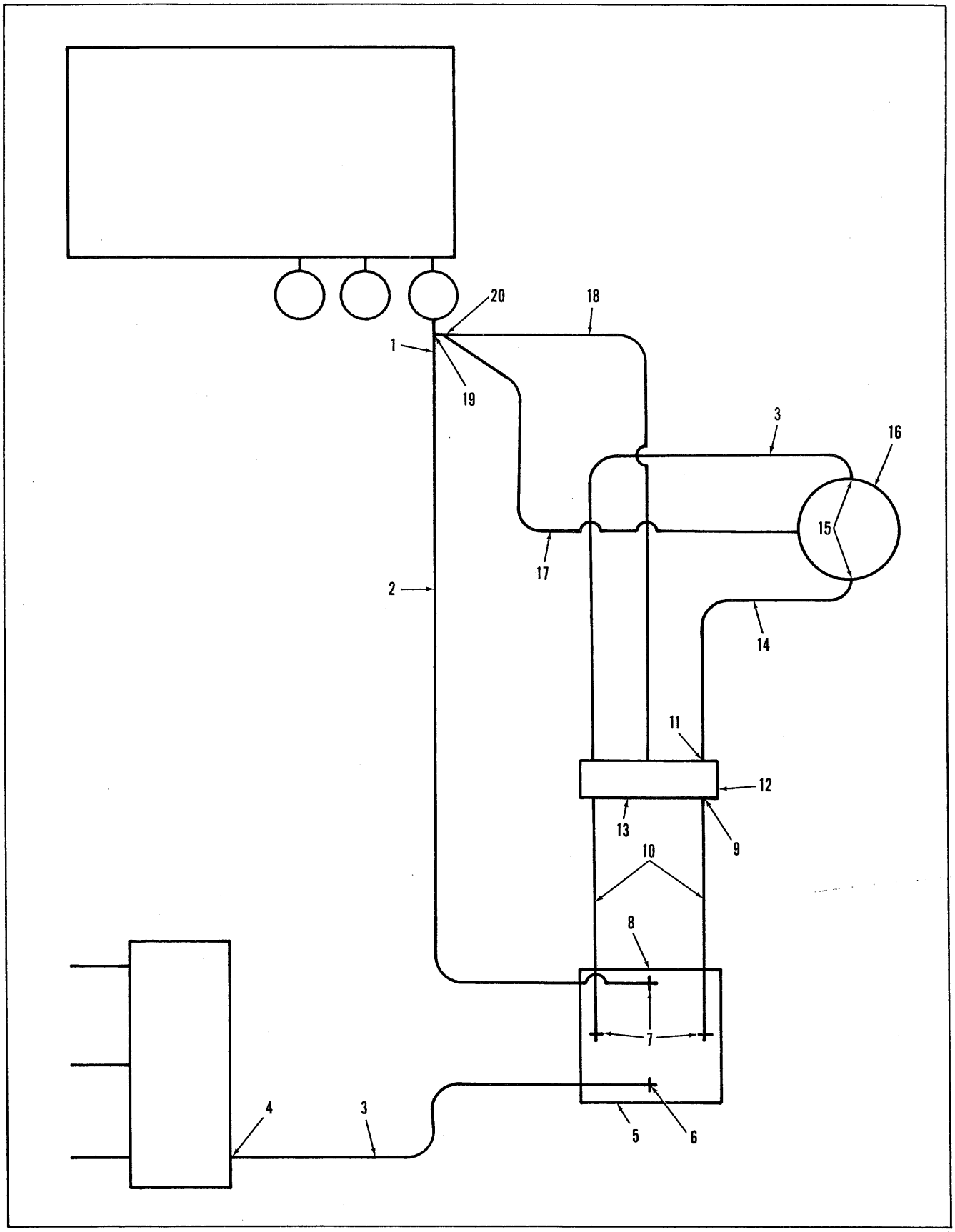


Figure 32. Swing Circuit Hydraulic System

Index Number	Part Number	Description	Quantity
		SWING CIRCUIT HYDRAULIC SYSTEM	
1	030175	Hose	1
2	030191	Tube	1
3	030036	Hose	2
4	020150	Adapter	1
*5	000025	Control Valve	1
6	020025	Adapter	1
7	020122	Connector	3
8	020023	Plug	1
9	020009	Connector	2
10	030141	Tube	2
11	020000	Union	2
12	020003	Plug	2
13	000029	Pressure Compensating Unit	1
14	030035	Hose	1
15	020013	Adapter Elbow	2
*16	000016	Swing Motor	1
17	030232	Hose	1
18	030164	Hose	1
19	020200	Tee	1
20	020154	Adapter Elbow	2

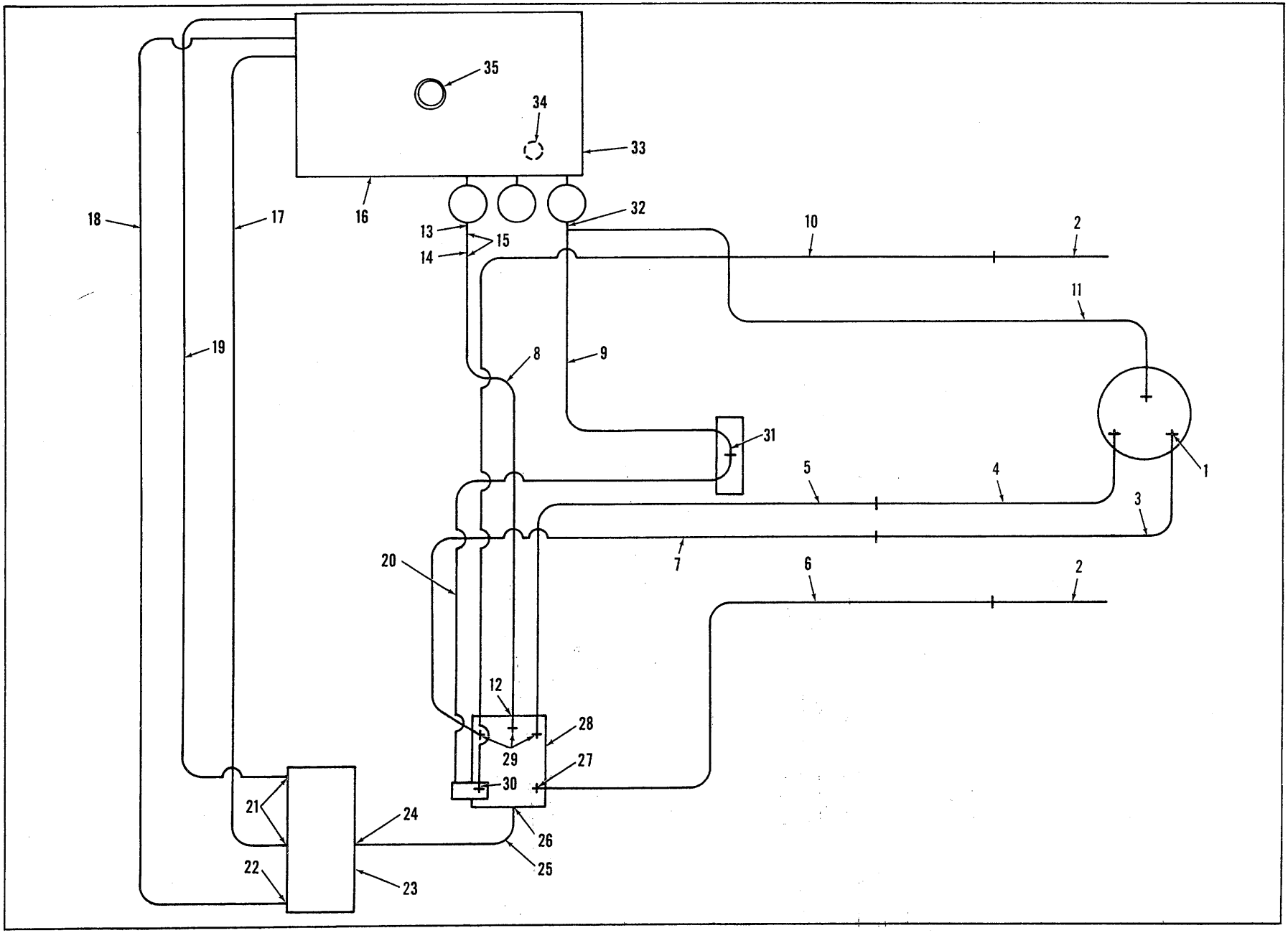


Figure 33. Dipstick and Upper Propel or Outrigger Hydraulic Circuit

Index Number	Part Number	Description	Quantity
		DIPSTICK AND UPPER PROPEL OR OUTRIGGER HYDRAULIC CIRCUIT	
1	020199	Elbow	2
2	030036	Hose	2
3	030239	Tube	1
4	030237	Tube	1
5	030234	Tube	1
6	030125	Tube	1
7	030233	Tube	1
8	030193	Tube	1
9	030175	Hose	1
10	030124	Tube	1
11	030232	Hose	1
12	020023	Plug	1
13	030194	Elbow	1
14	030212	Hose	1
15	400101	Clamp	2
16	050006	Reservoir	1
17	030180	Hose	1
18	030177	Hose	1
19	030179	Hose	1
20	030140	Tube	1
21	020147	Elbow	2
22	020148	Elbow	1
*23	000015	Pump	1
24	020149	Adapter	1
25	030127	Hose	1
26	020132	Adapter Elbow	1
27	020122	Connector	1
*28	000033	Control Valve	1
29	020157	Elbow	3
30	020009	Connector	2
	020126	Adapter	1
	000034	Pressure Compensating Unit	1
	010019	O-Ring	1
	020003	Plug	1
	020211	Plug	1
31	020121	Connector Tee	1
32	020152	Elbow	1
	020110	Nipple	1
	020205	Tee	1
	020112	Nipple	1
	050007	Filter-Complete	3
	020153	Tee	1
	020154	Elbow	1
33	020101	Plug	2
34	020156	Nipple	1
	*000019	Valve	1
	400200	Handle	1
	020105	Plug	1
35	020151	Cap	1
	040013	Breather	1

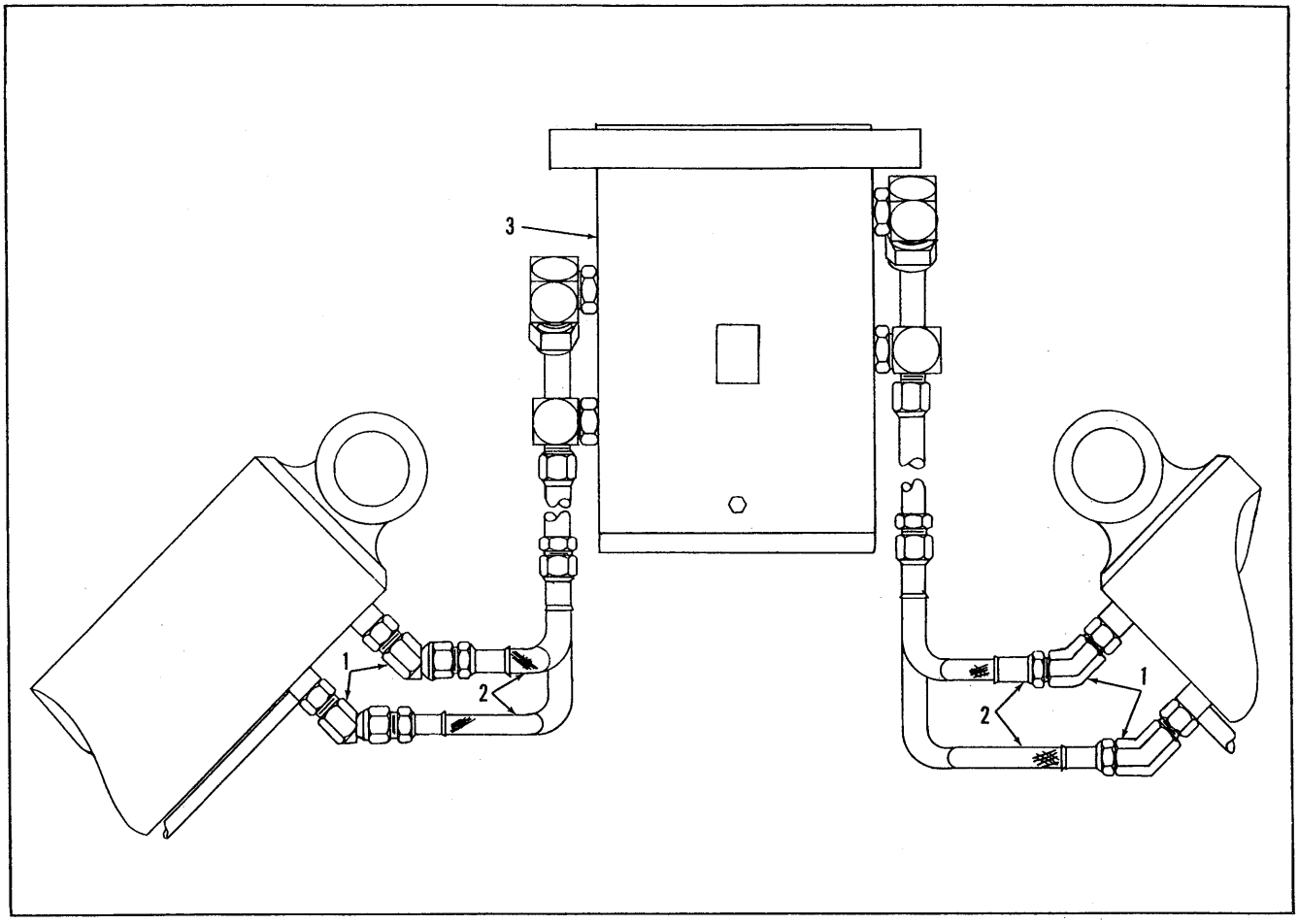


Figure 34. Lower Outrigger Hydraulic Circuit

Index Number	Part Number	Description	Quantity
		LOWER OUTRIGGER HYDRAULIC CIRCUIT	
1	020113	45° Elbow	4
2	030254	Hose	4
3	040113	Hydra-Swivel Assembly	1

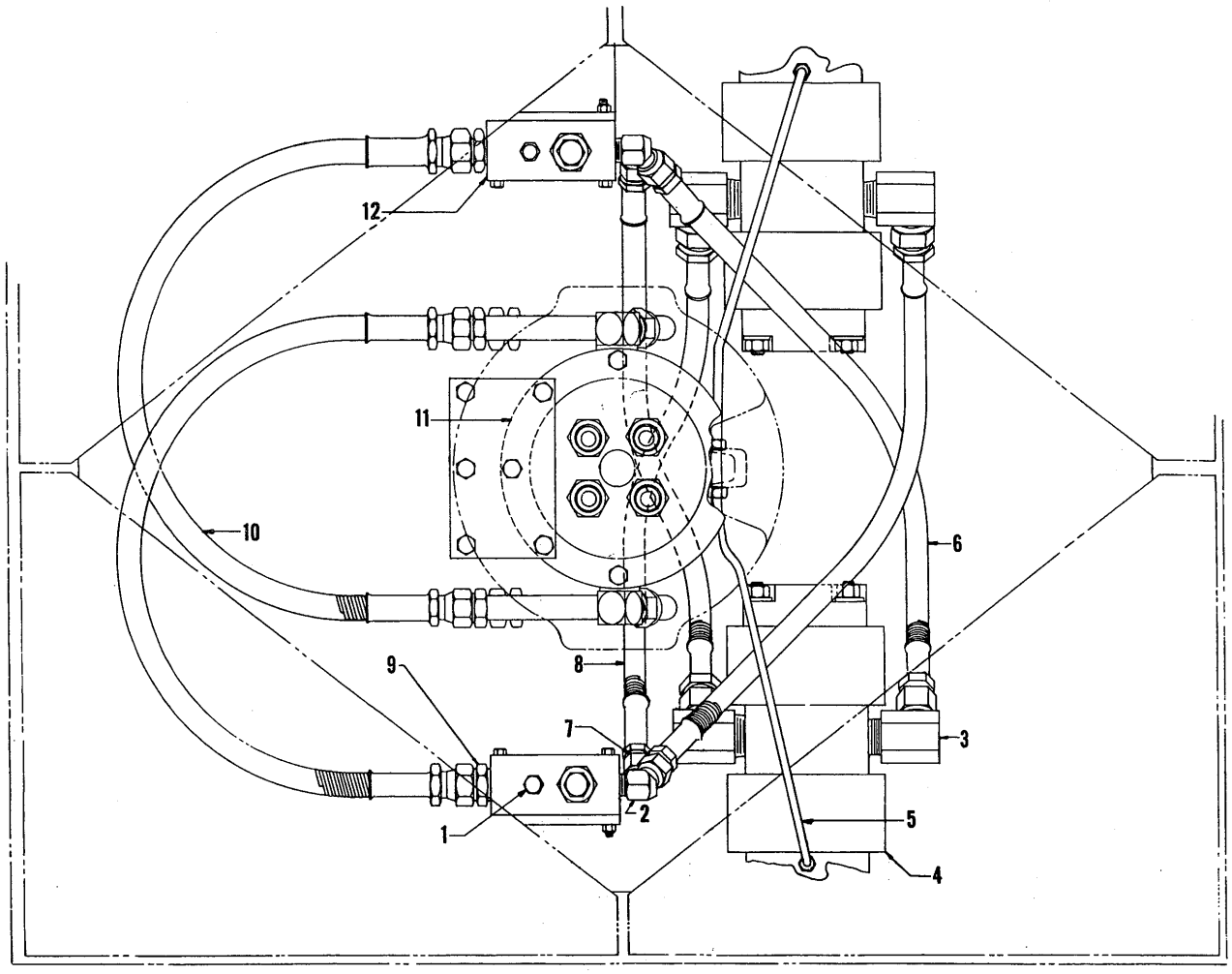


Figure 35. Lower Propel Hydraulic Circuit

Index Number	Part Number	Description	Quantity
		LOWER PROPEL HYDRAULIC CIRCUIT	
1	020101	Plug	4
2	020154	Elbow	2
3	020155	Elbow	4
4	000036	Propel Motor	2
5	030246	Drain Hose	2
6	030243	Hose	2
7	020111	Elbow	2
8	030242	Hose	2
9	020009	Connector	4
10	030241	Hose	4
11	040109	Hydra-Swivel Assembly	1
12	000035	Pressure Compensating Unit	2

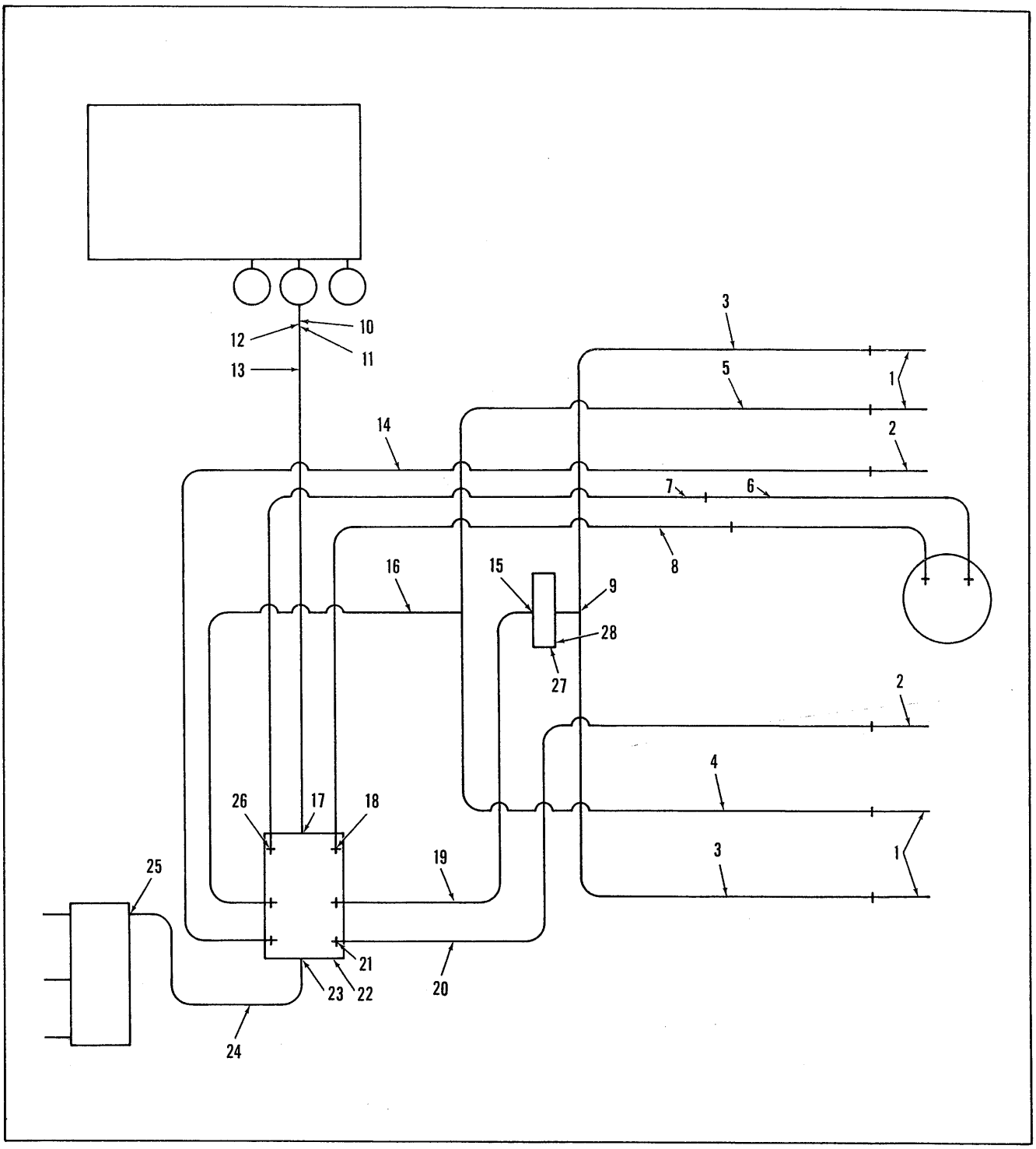


Figure 36. Boom, Bucket and Upper Propel or Outrigger Hydraulic Circuit

Index Number	Part Number	Description	Quantity
		BOOM, BUCKET AND UPPER PROPEL OR OUTRIGGER HYDRAULIC CIRCUIT	
1	030038	Hose	4
2	030036	Hose	2
3	030010	Tube	2
4	030008	Tube	1
5	030007	Tube	1
6	030240	Tube	1
7	030235	Tube	1
8	030236	Tube	1
9	020024	Connector Tee	1
10	030194	Elbow	1
11	030212	Hose	1
12	400101	Clamp	2
13	030192	Tube	1
14	030002	Tube	1
15	020009	Connector	1
16	030006	Tube	1
17	020159	Connector	1
18	020157	Elbow	1
19	030009	Tube	1
20	030001	Tube	1
21	020122	Connector	4
*22	000032	Control Valve	1
23	020132	Adapter Elbow	1
24	030165	Hose	1
25	020149	Adapter	1
26	020204	Elbow	1
27	020003	Plug	1
	020101	Plug	1
28	000037	Pressure Compensating Unit	1

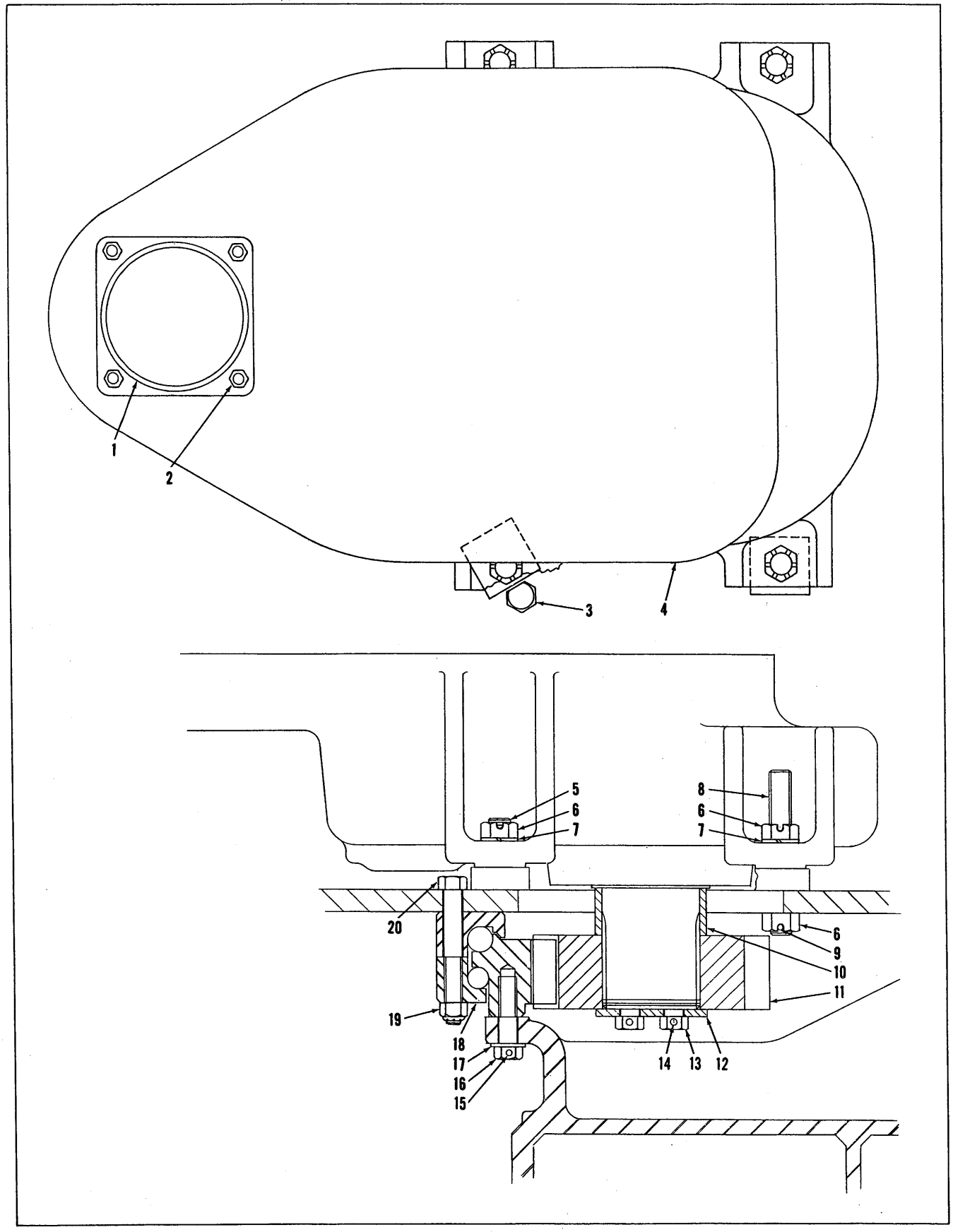


Figure 37. Swing System

Index Number	Part Number	Description	Quantity
		SWING SYSTEM	
1	400193	O-Ring	1
2	400055	Jam Nut	4
	400056	Lockwasher	4
	400212	Stud	4
3	400188	Cap Screw	2
*4	240039	Swing Gear Box	1
5	400185	Stud	2
6	400182	Nut	6
7	400097	Lockwasher	4
8	400184	Stud	2
9	400183	Cotter Pin	4
10	240042	Spacer	1
11	200014	Swing Pinion	1
12	240041	Cap	1
13	400187	Cap Screw	2
14	400191	Lockwire	1
15	400180	Lockwire	18
16	400190	Cap Screw	36
17	400203	Washer	36
18	220025	Swing Bearing	1
19	400202	Nut	36
20	400189	Cap Screw	34
	250020	Swing Bearing Shim (No. 31 gage)	as reqd
	250019	Swing Bearing Shim (No. 22 gage)	as reqd
	250018	Swing Bearing Shim (No. 16 gage)	as reqd
	250024	Swing Bearing Shim (0.005 in.)	as reqd

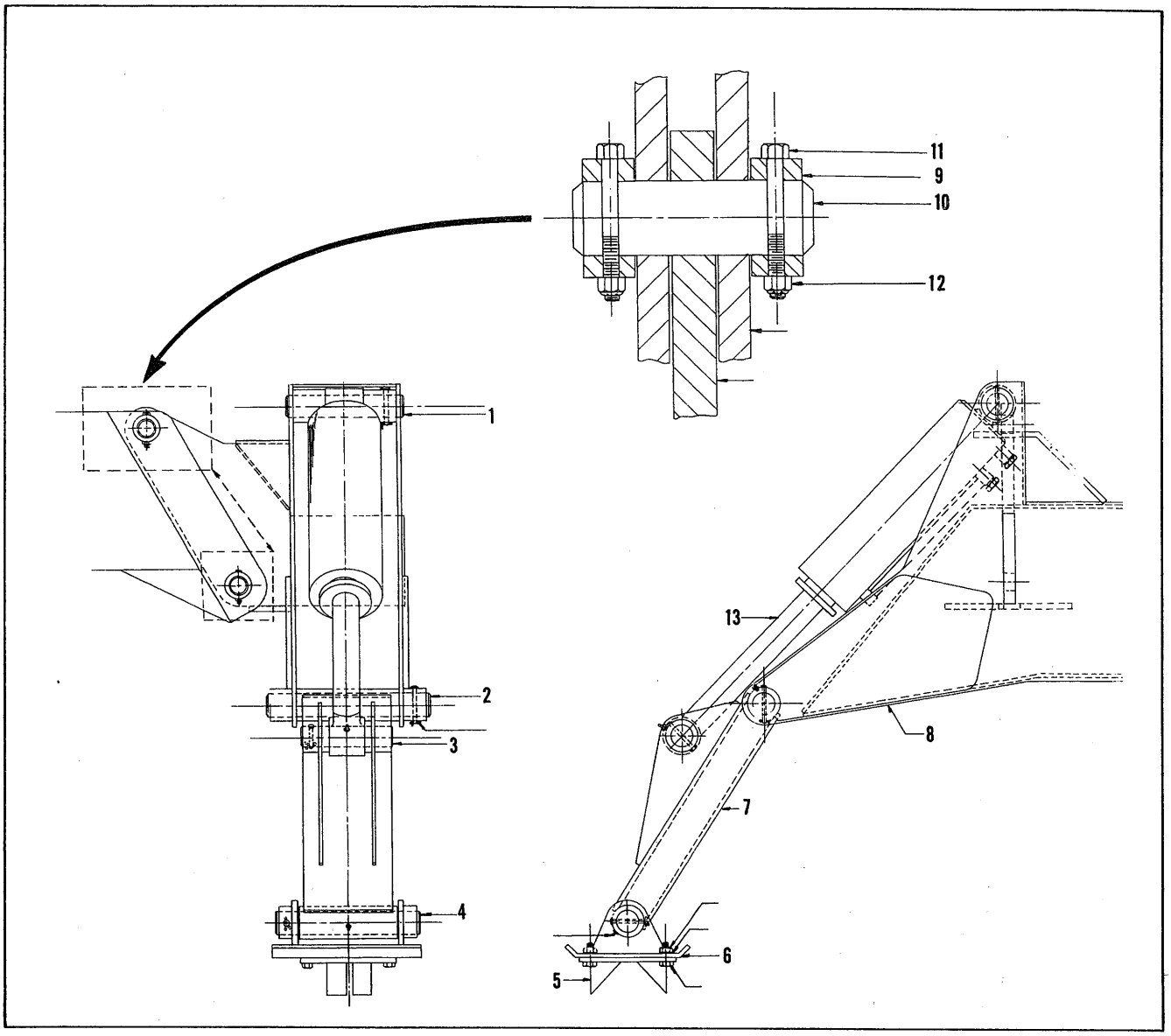


Figure 38. Outrigger System - Hein-Werner Carrier

Index Number	Part Number	Description	Quantity
		OUTRIGGER SYSTEM - HEIN-WERNER CARRIER	
1	210029	Cylinder Base Pin	2
2	210023	Arm Pivot Pin	2
3	210025	Cylinder Rod Pin	2
4	210022	Foot Pivot Pin	2
5	140014	Foot Pad	2
6	140001	Foot Assembly	2
7	140024	Arm Assembly	2
8	140038	Outrigger Frame	1
9	140041	Mounting Collar	8
10	210085	Mounting Pin	4
11	400332	Mounting Bolt	8
12	400062	Lock Nut - Mounting Bolt	8
13	040099	Cylinder Assembly	2

NOTE: Outriggers are available for mounting on commercial trucks. These outriggers are identical except that they are welded rather than bolted. All parts are identical.

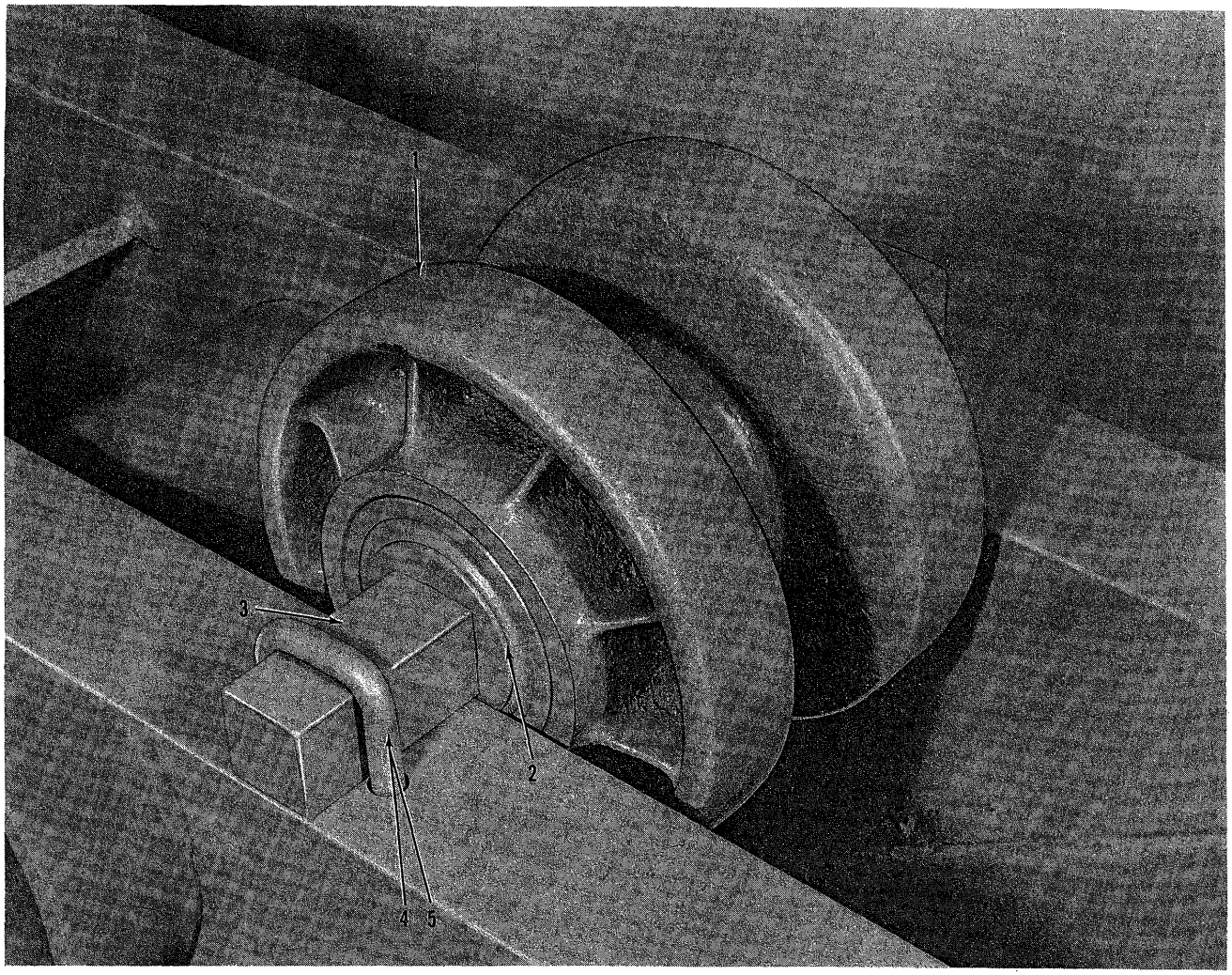


Figure 39. Roller and Shaft Assemblies

Index Number	Part Number	Description	Quantity
		ROLLER AND SHAFT ASSEMBLIES	
1	800005	Roller	20
2	800004	Bearing	40
3	800010	Roller Shaft	20
4	800035	U-Bolt	40
5	800034	Bevel Washer	80

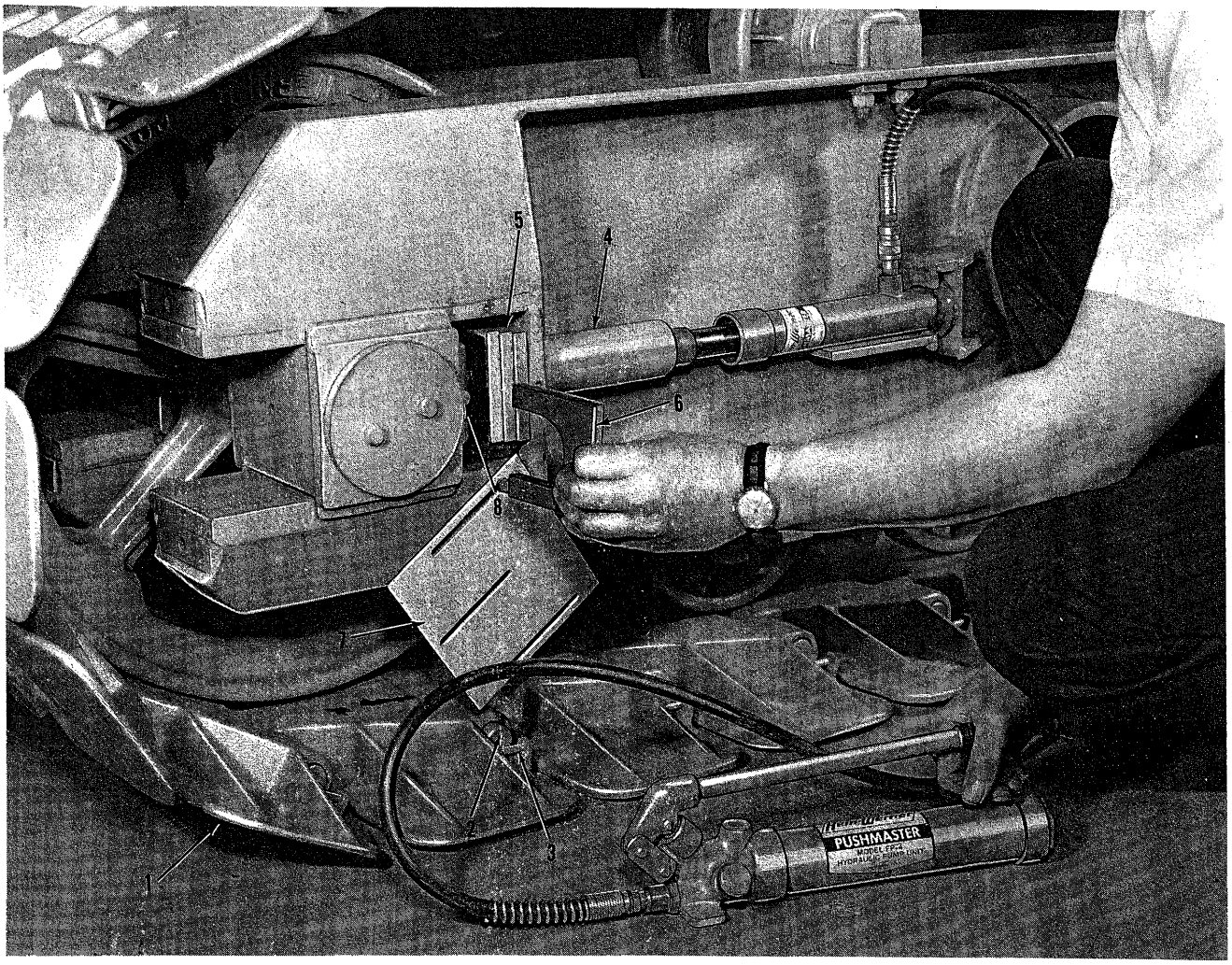


Figure 40. Crawler Drive Parts

Index Number	Part Number	Description	Quantity
		CRAWLER DRIVE PARTS	
1	800081	24" Track Shoe	86
	800079	32" Track Shoe	86
2	800019	Track Shoe Pin	86
3	800023	Drive Lock Pin	86
4	800032	Bearing Adjuster	4
5	800012	1/4" Track Adjusting Shim	as reqd
6	800085	1/8" Track Adjusting Shim	as reqd
7	800098	Shim Retainer Plate	4
8	800024	Groove Pin	4

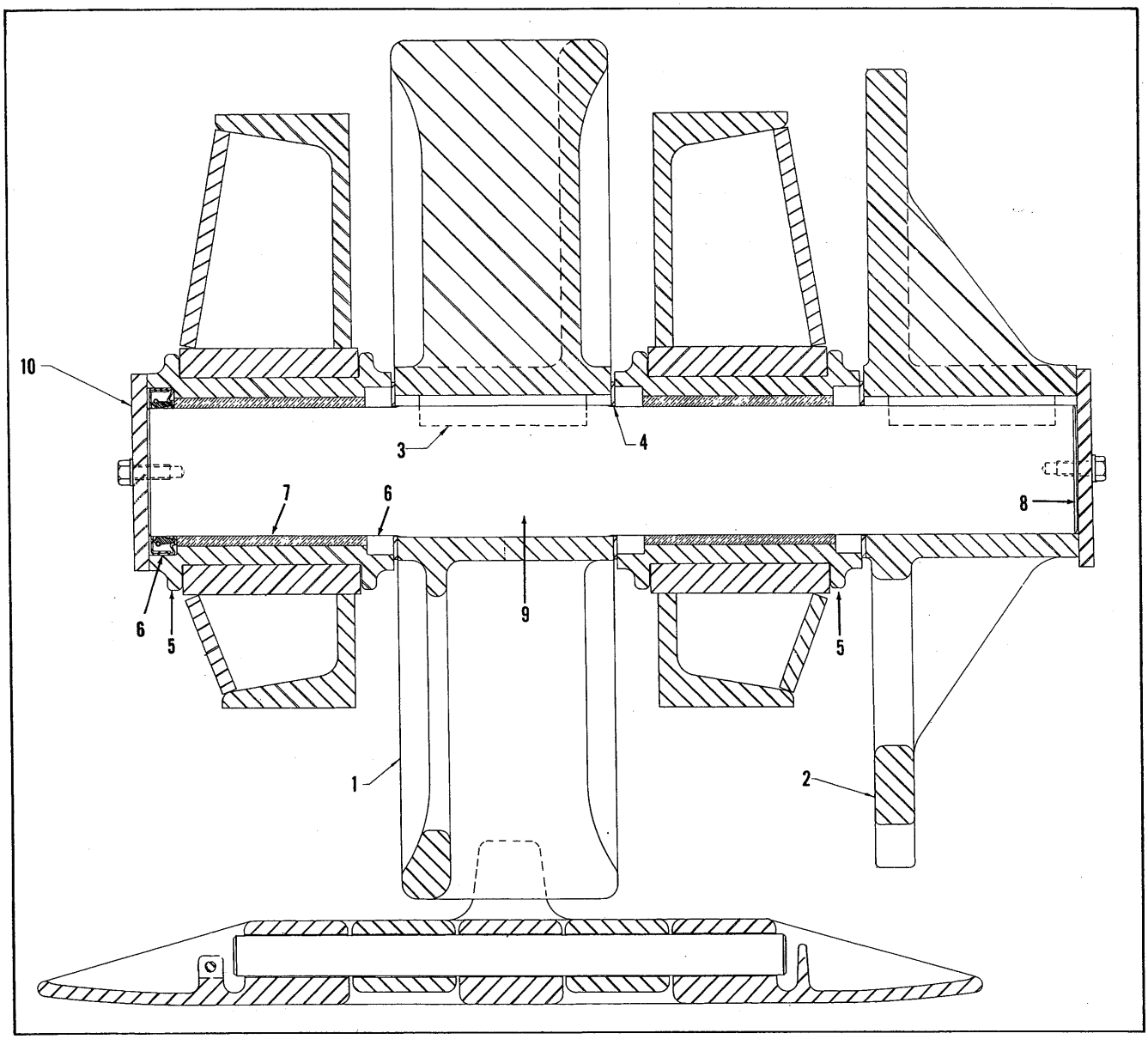


Figure 41. Tumbler Section

Index Number	Part Number	Description	Quantity
		TUMBLER SECTION	
1	800001	Tumbler	2
2	800013	Sprocket	2
3	800075	Keys	8
4	800072	Thrust Washer	6
5	800009	Bearing Block	4
6	800007	Shaft Seal	8
7	800064	Shaft Bushing	4
8	800099	Shaft Shim	as reqd
	800100	Shaft Shim	as reqd
9	800066	Tumbler Shaft	2
10	800014	End Plate	4
	400319	Grease Fittings (not illustrated)	4

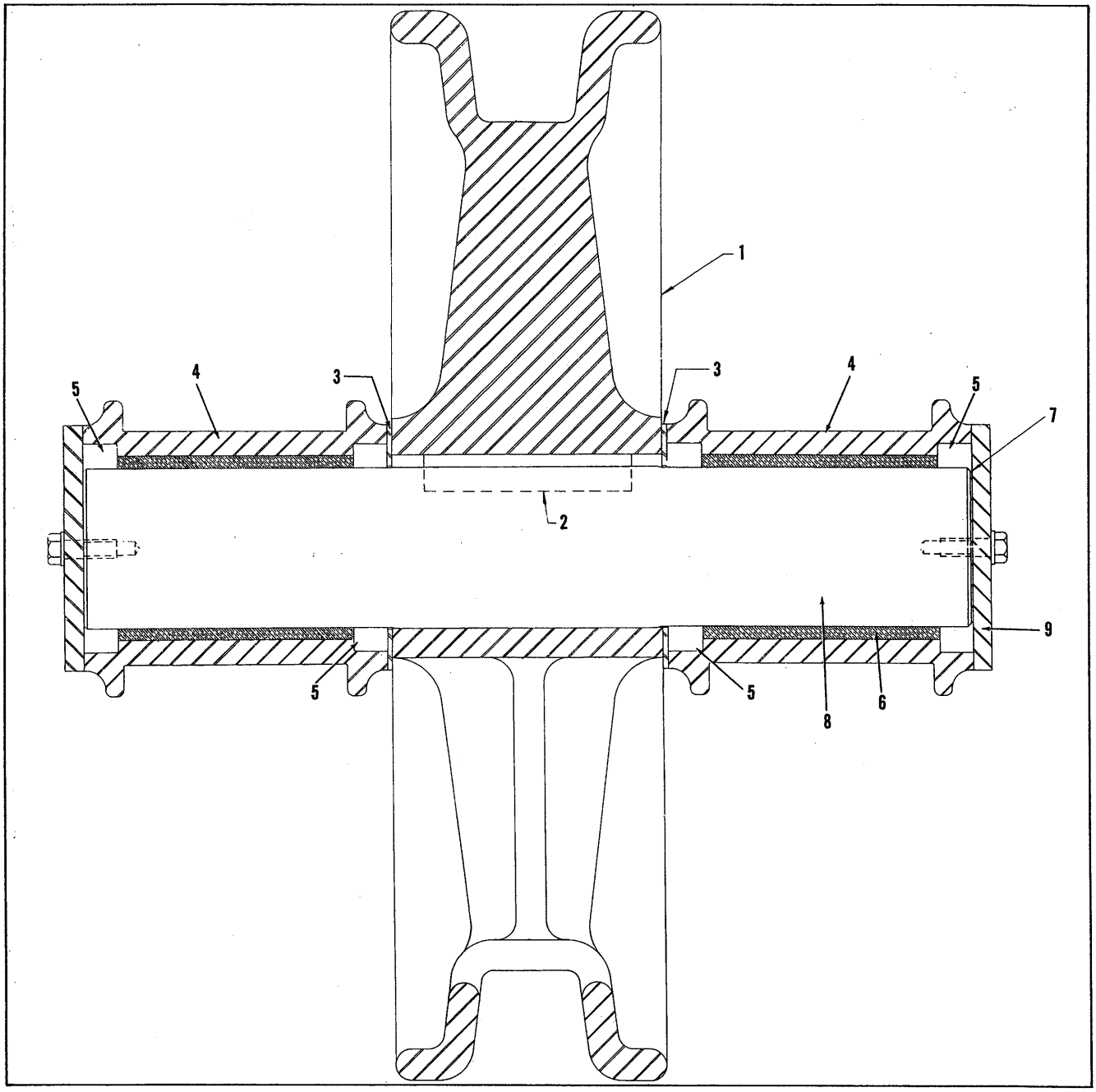


Figure 42. Idler Section

Index Number	Part Number	Description	Quantity
		IDLER SECTION	
1	800003	Idler	2
2	800075	Key	2
3	800072	Thrust Washer	4
4	800009	Bearing Block	4
5	800007	Shaft Seal	8
6	800064	Shaft Bushing	4
7	800099	Shaft Shim	as reqd
	800100	Shaft Shim	as reqd
8	800065	Idler Shaft	2
9	800014	End Plate	4
	400319	Grease Fittings (not illustrated)	4

MISCELLANEOUS PARTS (NOT ILLUSTRATED)

Index Number	Part Number	Description	Quantity
	050008	Fuel Tank	1
	120253	Fuel Tank Mounting Frame-L. H.	1
	120252	Fuel Tank Mounting Frame-R. H.	1
	400293	Gear Box Adjusting Bolts	4
	400301	Side Frame to Cross Tube Hex Head Bolts	4
	230105	Propel Drive Chain (2" pitch, 70 pitches)	2
	130062	Turntable	1
	400280	Engine Mounting Bushing	4
	400281	Cupped Washer - Engine Mount	4
	120264	Engine Mount Spacer - 1/2" Thick	4

AVOID ACCIDENTS

MOST ACCIDENTS, WHETHER THEY OCCUR IN INDUSTRY, ON THE FARM, AT HOME OR ON THE HIGHWAY, ARE CAUSED BY THE FAILURE OF SOME INDIVIDUAL TO FOLLOW SIMPLE AND FUNDAMENTAL SAFETY RULES OR PRECAUTIONS. FOR THIS REASON MOST ACCIDENTS CAN BE PREVENTED BY RECOGNIZING THE REAL CAUSE AND DOING SOMETHING ABOUT IT BEFORE THE ACCIDENT OCCURS.

REGARDLESS OF THE CARE USED IN THE DESIGN AND CONSTRUCTION OF ANY TYPE OF EQUIPMENT THERE ARE MANY CONDITIONS THAT CANNOT BE COMPLETELY SAFEGUARDED AGAINST WITHOUT INTERFERING WITH REASONABLE ACCESSIBILITY AND EFFICIENT OPERATION.

A careful operator is the best insurance against an accident. The complete observance of one simple rule would prevent many thousand serious injuries each year. That rule is:
Never attempt to clean, oil or adjust a machine while it is in motion.

NATIONAL SAFETY COUNCIL